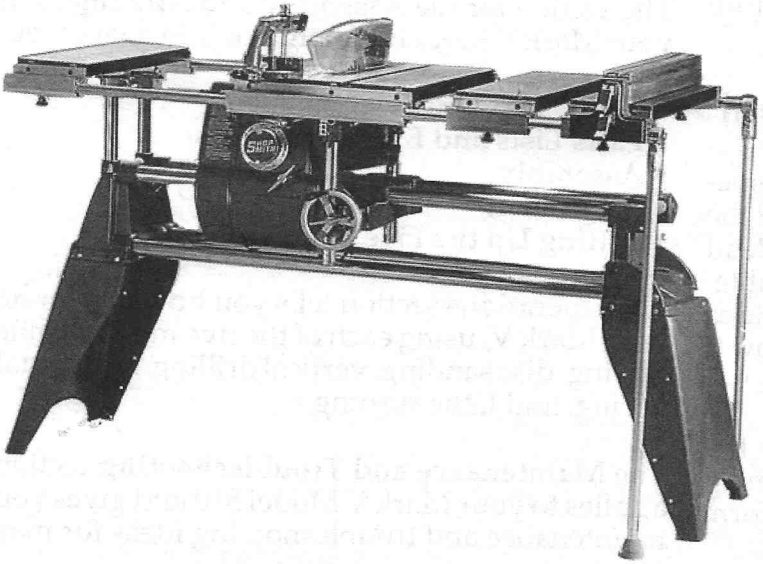
Shopsmith® Mark V Home Workshop System



MARK V MODEL 520

Designed and Built in Dayton, Ohio since March 1999.

WARNING

Read the SAFETY information in the Introduction section and complete the ASSEMBLY AND ALIGNMENT procedures before operating the Shopsmith Mark V.

Use only Shopsmith parts and accessories on your Mark V. Using non-Shopsmith parts may create a hazardous condition and will void your warranty.

TABLE OF CONTENTS

Introduction ..... **ii**

← **Safety** **A-1**
. Electrical Requirements A-3

← **Assembly and Alignment** **B-1**
. Parts Lists & Exploded Views B-5
. Assembly B-15
. Alignment B-22
. Mode Setups B-38

← **Operations** **C-1**
. Table Sawing C-1
. Disc Sanding C-7
. Vertical Drilling C-10
. Horizontal Boring C-14
. Lathe Turning C-16
. Mark V Speed Chart C-23

← **Maintenance & Troubleshooting** **D-1**
. Maintenance Schedule D-1
. Troubleshooting Guide D-11

← **Other Manuals & Product Literature**

845444 Rev. 3/99

Welcome to Shopsmith!

Congratulations on your new Shopsmith Mark V Woodworking System. It is built to deliver years of reliable service as well as help you expand your workshop capabilities. The Mark V's quality, accuracy and versatility allows you to perform tasks and do projects you would not have before considered.

How to Use this Owner's Manual

First, read this introductory section, paying special attention to the SAFETY rules. Then read the section on the model of Mark V you own. Read the Operations and the Maintenance & Troubleshooting sections. This will give you a better idea about what the Mark V can do for you and how it works.

Finally, return to this section and reread the SAFETY rules. Then go to and do the Assembly and Alignment instructions before you perform any operations.

Keep this Owner's Manual handy for future reference, and keep other Shopsmith Owner's Manuals in the back of the binder.

SECTIONS

You should have noticed by now that this owner's manual has five major tabbed sections:

- **Safety**
- **Assembly and Alignment**
- **Operations**
- **Maintenance & Troubleshooting**
- **Self Study Course**
- **Bandsaw**
- **Jointer**
- **Dust Collector**
- **Beltsander**
- **Strip Sander**
- **Scroll Saw**
- **Planer**
- **Lathe Duplicator**
- **Power Station**
- **Accessories**

Summary of Manual, by section:

The **Safety** section gives you safety instructions and what each safety device is used for.

The section for the **Assembly and Alignment** of your Mark V Model 510 contains information on:

- **Terms to Know**
- **Parts Lists and Exploded views**
- **Assembly**
- **Alignment**
- **Setting Up the Five Basic Modes**

The **Operations** section tells you how to operate your Mark V, using each of the five modes– table sawing, disc sanding, vertical drilling, horizontal boring, and lathe turning.

The **Maintenance and Troubleshooting** section applies to your Mark V Model 510 and gives you maintenance and troubleshooting ideas for may issues.
The tab marked **Self Study Course**, contains a do-it-yourself instructional guide to learning woodworking fundamentals. Even if you are already an experienced woodworker, you'll have fun reviewing and testing your knowledge with the test quizzes at the end of each lesson. The Self Study Course is supplemented by the book, **Power Tool Woodworking For Everyone,** included with your purchase of the Mark V.

The last tabbed sections are ones that you fill up with other Shopsmith manuals and product literature. As you acquire other accessories and tools, simply pop open this three ring binder and insert the new product literature behind its appropriate index tab. This way you always know where to look for product information. (We have also included an information sheet on some of these products for your information)

History of the Mark V

The concept of a multipurpose tool– a single machine that does the job of many– is probably as old as woodworking. In just the last two centuries, the United States Patent Office has issued dozens of patents for ingenious machines in one end and they'd spit furniture out the other.

Patent No. 511,618 for a "Woodworking Machine", issued to Stephen Hurteau in 1893, is typical of these inventions, as illustrated in Figure A. According to Hurteau, "My invention has reference to a combination wood working machine and consists of a strong frame on to which is arranged a lathe, circular saw, planer, jig saw, bans saw, auger, shaper, etc..., and is arranged in solid and compact form, its object being to provide a machine capable of performing the functions of several others, thereby saving expense on first cost."

But Hurteau's "Woodworking Machine"– and many others like it– was a pipe dream. Only a few of the more practical multipurpose tool designs were ever built and marketed. Most of these were massive commercial-duty machines for furniture manufacturers, mill operators, and other professional woodworkers. They usually incorporated a circular saw, jointer, molder or shaper, and horizontal boring machine arranges around a single powerful motor. A woodworker could preset each of these components, then walk around the tool, machining one board after another to precisely the same dimensions and shape.

On the other end of the scale, the "Red Jacket" was a compact multipurpose bench tool for the home handyman, sold in the 1930's (See Figure B) It's power plant was an ordinary electric hand drill that could either be detached or mounted in a stand. When mounted, the drill powered a small circular saw, disc sander, and lathe.

However, none of these early multipurpose tools achieved any lasting success. Most machines were either too expensive or their capacities too lim-

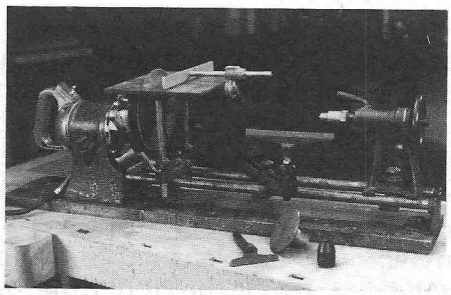


Figure B

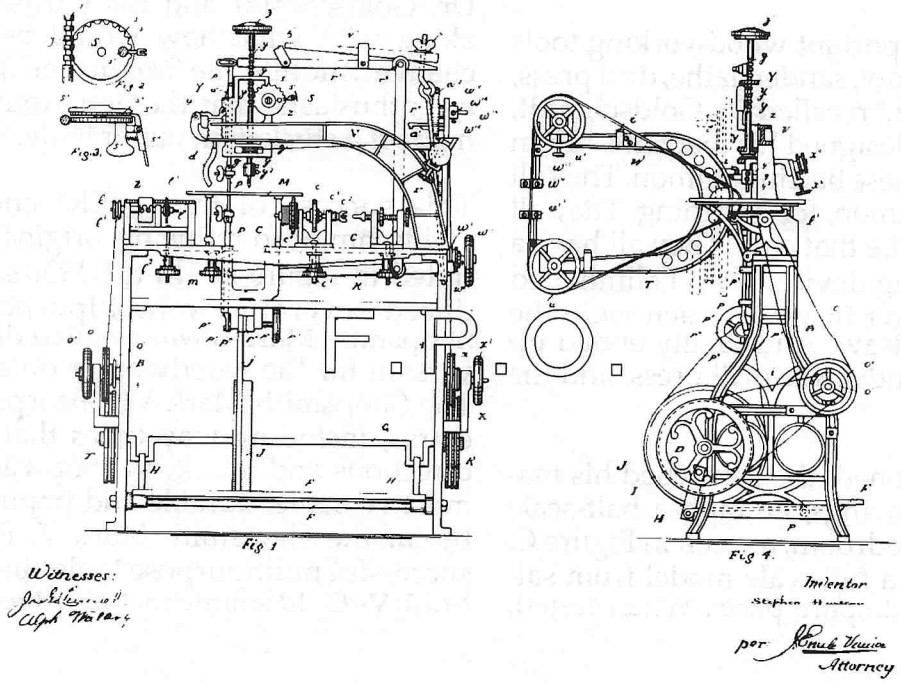


Figure A

ited to interest the average craftsman. It wasn't until Dr. Hans Goldschmidt introduced his "Shopsmith"- a five-in-one machine, similar to the present Mark V- that a multipurpose woodworking tool became accepted and commonplace.

Hans Goldschmidt came to the United States in 1937, fleeing Nazi Germany. Once in America, he became a woodworker out of necessity. Like so many folks in the Depression, he couldn't find a job, even though he had a doctorate in Administrative Engineering from the University of Berlin. So he scraped together enough money to buy some woodworking tools and made handicrafts- napkin holders, trays, and coasters.

After World War II, he became a foreman in a woodworking shop. All his life he had dreamed of being an inventor, and it was here that he got his chance. "The basis of being an inventor is recognizing a need," Dr. Goldschmidt said in a later interview. "Then try to invent something that fills that need."

The need that Dr. Goldschmidt recognized was for a simple machine to perform a multitude of woodworking tasks. Watching the workers use the power tools in the shop, he saw much duplication- too many motors, pulleys, arbors. He also noticed a growing market for power tools, since so many soldiers had learned to use machinery during the war. It was the right time, he decided, to introduce an affordable, capable multipurpose tool.

"I listed the most important woodworking tools and came up with a saw, sander, lathe, drill press, bandsaw, and jigsaw," recalled Dr. Goldschmidt, telling how he had designed his machine. "Then I analyzed what all these had in common. They all have a motor in common, for one thing. They all have a turning spindle that cuts. They all have a table or work holding device. Then I eliminated those tools that didn't fit well, which were the jigsaw and the bandsaw. And finally ended up with the saw, the sander, the drill press, and the lathe."

Goldschmidt envisioned, then sketched his machine. From his drawings, he built a half-scale model in his spare bedroom, as seen in Figure C. Later he assembled a full scale model from salvaged hardware and spare parts. When tested, his invention worked just as he had hoped: It had the capacity to perform most common woodworking operations, yet it was simple enough to be manufactured and sold at a reasonable cost.

The inventor and several of his friends formed the Magna Engineering Company. They began making multipurpose tools at a lumberyard in Berkeley, California, building the first machines by hand. Montgomery Ward was Magna's first

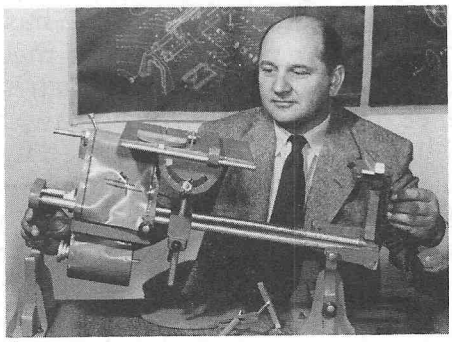


Figure C

big customer, ordering 250 "Shopsmith Model 10ER's" for the west coast stores for Christmas, 1947. (The name "Shopsmith" was suggested to Dr. Goldschmidt and his partners at a party, along with what now would be considered a chauvinistic title, the "Mixmister".) Response was so enthusiastic that the department store chain made it a stock item nationwide.

This success of the "10ER" encouraged Dr. Goldschmidt to refine his original design, illustrated in Figure D. In the 1950's, Magna introduced several new multipurpose tools. The Shopsmith Mark II was a scaled down, economy version for the woodworker on a tight budget. The Shopsmith Mark VII incorporated a lot of extras, including way tubes that tilted in both directions and a built-in shop vacuum. But the most versatile, durable and popular model was by far the Shopsmith Mark V. For this line of successful multipurpose tools- in particular, the Mark V- Goldschmidt achieved recognition as an

inventor in Time Magazine, The Saturday Evening Post, Popular Science, the Harvard Business Review, and other publications. Later, he went on to invent many other products.

The Mark II and the Mark VII were only available briefly, but thousands of Shopsmith Mark V's were manufactured until the early 1960's. Then a variety of changes within the company and with the buying public caused production to cease. In 1971, John Folkerth visited an old plant in search of spare parts. He not only found the parts, but molds, dies, jigs– everything needed to make new Mark V's. The owners were willing to sell and John jumped at the opportunity. By 1973, the Shopsmith Mark V was back on the market, manufactured by a new company– Shopsmith, Inc.

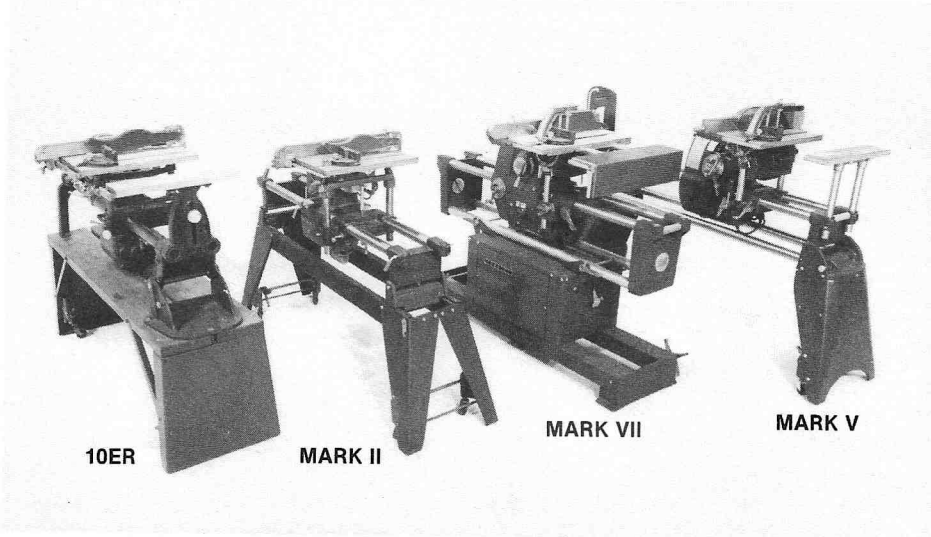


Figure D

WARNING WARNING WARNING WARNING

SAFETY

Safety First

The Shopsmith Mark V has many built-in safety features. But, the effectiveness of these features depends on you. To protect yourself from injury:

READ, UNDERSTAND AND FOLLOW ALL THE INFORMATION IN THIS OWNER'S MANUAL.

The meanings of WARNINGS, CAUTIONS, AND NOTES are:

WARNING

A WARNING is given when failure to follow the directions could result in injury, loss of limb, or life.

CAUTION

A CAUTION is given when failure to follow the directions could result in temporary or permanent damage to the equipment.

NOTE

A NOTE is used to highlight an important procedure, practice or condition.

Eye Protection

- Always wear eye protection when you use power equipment. Use goggles, safety glasses or a face shield to protect your eyes.
- Goggles completely surround and protect your eyes. Many goggles will also fit over regular glasses. Be sure your goggles fit closely, but comfortably.
- Safety glasses don't fog as easily as goggles and can be worn all the time. Regular eyeglasses normally have only impact resistant lenses. They are not safety glasses.
- A face shield protects your entire face. And you can flip it up out of the way when you don't need it. A face shield can be used with regular glasses.

Ear Protection

- Prolonged exposure to high noise levels from high speed power equipment can damage your hearing.
- Hearing protectors screen out noise that can damage your ears. Wear hearing protection when you are exposed to high intensity power equipment noise.

Sawdust and Chips

- Sawdust and chips can be fire hazards and breathing sawdust can be a health hazard. Sawdust may cause you physical discomfort, especially if you have emphysema, asthma, or an allergic reaction. The sawdust from some woods can also be toxic. When sawing or sanding:
  - Attach a dust collector or shop vacuum to the dust chute in the lower saw guard.
  - Wear a close-fitting dust mask if a significant amount of dust is released into the air. Clear or replace the filters in the mask regularly.
  - Open a window or use a fan to ventilate your shop.

Saw Guards

- Most shop accidents happen on the table saw. For this reason, **always keep the upper and lower saw guards in place whenever you operate the Mark V in the table saw mode.** The ONLY exception to this rule is when you need to saw part way through stock– such as when cutting a rabbet or groove, or when using the dado or molder accessory. Then you must remove the upper saw guard. Whenever you

WARNING WARNING WARNING WARNING

remove the upper saw guard, KEEP the lower saw guard in place and work with extreme caution.

- The saw guards provide a physical barrier between you and the blade, no matter what height or angle you adjust the worktable.
- The lower saw guard has a spring loaded side that automatically adjusts to the height or angle you adjust the worktable.
- The upper saw guard is clear so that you can see the blade. There's a removable plastic insert in front of the blade. This can be easily cleaned or replaced so that you can keep your line of sight clear.
- The lower saw guard has a sliding side for easy accessory attachment and dust collection efficiency.
- The upper saw guard has a riving knife that is positioned 1/8" from the blade regardless of stock thickness. The riving knife has anti-kickback cams that capture the stock in the event of a kickback.
- The riving knife mounts in the lower saw guard. The lower saw guard mounts to the quill. This allows you to adjust the blade without having to go back and align the riving knife with the blade.

Table Saw Kickback

- Table saw accidents are often associated with kickback. Kickback is the ejection of the stock from the saw back toward the operator. Kickback causes loss of control and your hand could be thrown into the blade or you could be hit by flying stock. Never stand directly in the line of rotation of a moving blade. This lessens your chances of being hit by flying stock, if a kickback occurs. Kickback is caused by:
- The kerf of the stock closing up and **pinching** the rear of the saw blade.
- The stock **wedging** between the rip fence and the rear of the saw blade.
- The stock **binding** against the sides of the blade as it passes through the stock.

To Prevent Kickback:

- Always keep the upper and lower saw guards in place. An anti-kickback mechanism on the guards helps prevent the stock from binding the bade and the stock from being thrown back toward the operator. Make sure the riving knife is aligned properly with the blade.
- Never cut stock freehand. Always use a push stick, push block, fence straddler, feather board, fixture, rip fence or miter gauge to guide and support the stock.
- Never reach over the blade while the machine is running. You could slip or twist the stock, causing a kickback. Use a rear support table or a roller stand to help support the stock and turn off the machine before removing stock or scraps.
- Keep blades sharp, properly set and free of pitch. Well maintained blades minimize the likelihood of kickback.
- Avoid cutting wet or pitchy wood.
- The anti-kickback mechanism is not effective when 8" diameter blades are used.
- When **cross cutting**, always use the miter gauge and hold the stock firmly against the protractor.
- When **cross cutting**, never use the miter gauge with the rip fence unless you mount a stoop block to the rip fence to prevent the stock from binding between the rip fence, miter gauge and blade.
- When **ripping**, always use the rip fence to guide and support stock.
- Make sure the rip fence is parallel to the blade. If the rip fence closes in toward the rear of the blade, the rip fence will tend to wedge the stock against the blade.
- When **cross beveling**, always place the miter gauge on the downward side of the worktable.

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- When **rip beveling**, always mount the rip fence on the downward side of the worktable.
- Always cut with the smooth, hard surface of the stock against the worktable. Anti-kickback mechanisms may not be effective when cutting smooth, hard surfaces.

Electrical Requirements

- Pay particular attention to the connection between your power equipment and your power source. Before you plug in your Mark V, check the voltage and the amperage of the circuit you will be using. The wall receptacle and wires in the circuit must be rated for at least 15 amps.
- The rating of the components in the circuit wires and receptacles must be high enough to handle the load (in amps) of that motor, plus any other tools or appliances you may have plugged into the same circuit and running at the same time.

Circuit

- The Mark V 115-volt motor is rated at 1-1/8 hp. It develops more than 1-1/2 hp in use and "pulls" 13-14 amps when running under a heavy load. The headstock motor runs on standard U.S. house current– 120 volts, 60 hz. The wire size (gauge) in the circuit you use must be rated for at least 15 amps. Using wire and receptacles rated to handle 20 or 25 amps will give you an even bigger safety margin.

Fuses

- We recommend you install circuit breakers or fuses which are time-delayed. Fusetron T-15 fuses are recommended. **Do not use fuses or circuit breakers larger than 15 amps.** When you first turn on the machine, the motor pulls high amperage to get up to running speed. A time delay fuse or circuit breaker won't blow during this initial surge. Always start the Mark V at "Slow" speed setting to prevent blowing fuses and tripping the circuit breaker.
- If you need to run a new circuit to operate the Mark V, be sure that the wire and receptacle you use is rated to handle the amperage of the headstock motor, and is at least 15 amps.

Grounding

- The circuit you see should be properly grounded.
- The Mark V plug has three prongs, as shown in Figure A-1. The receptacle should have three corresponding holes. Do not modify the plug. If it will not fit the receptacle, have the proper receptacle installed.

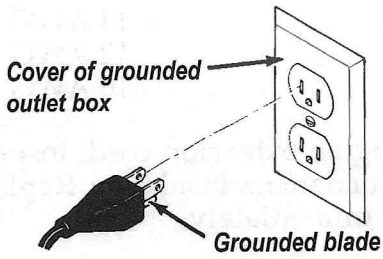

Figure A-1

- If you have a two-hole receptacle, use a **temporary** adapter to plug in the Mark V, as illustrated in Figure A-2. The grounding lug or wire on the adaptor **MUST** be connected to a permanent ground such as a grounded outlet box. The temporary adapter should be used only **until** a properly grounded outlet can be installed. **(Adapters are not allowed in Canada.)**

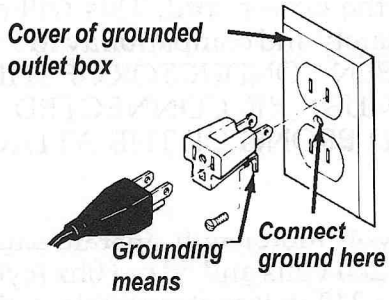

Figure A-2

- If you are unsure as to whether your outlet box is grounded, ask a licensed electrician.

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Extension Cords

- If you use an extension cord to plug in your Mark V, be sure it is a three-conductor cord with a grounding plug and receptacle.
- The wire gauge must be thick enough to prevent loss of power and overheating– the longer the cord, the thicker the wire should be. Use the chart to determine the American Wire Gauge wire size required:

Cord Length	Minimum Wire Size
25 ft.	14 AWG
50 ft.	12 AWG
100 ft.	10 AWG

- Before using an extension cord, inspect it for loose wires or damage insulation. **Replace damaged cords immediately.**
- Do not let the connection between the power cord and an extension cord lie on a damp or wet surface.

Mark V 240-Volt Motor

- When misused, 220/240 volts is more dangerous than the United States household voltage of 120 volts. Have a qualified electrician install the 15 amp 240 -volt circuit, with 10 amp fuses. Have your electrician recommend a compatible plug for the power cord. This will assure the circuit's safety and compatibility to the Mark V. THE GREEN CONDUCTOR OF THE POWER CORD MUST BE CONNECTED TO THE GROUND PRONG OF THE ATTACHMENT PLUG.
- The 240-volt motor will operate satisfactorily on 220 to 260 volts and 50 or 60hz (cycles). This makes the 240-volt motor usable in the United States where 220/240 volt, 60 hz (cycles) current is used and in many foreign countries where the standard supply is 220/240 volts, 50 hz (cycles). No attachment plug is supplied because of the wide variety of plugs in use.
- The plug and the outlet **must** be matched to the ampere rating of the Mark V (6 to 8 amps loaded). **Do not** use the Mark V on any circuit with wires and plugs rated higher than 15 amps and 250 volts. We recommend that you use no higher than 10-amp fuses on this circuit.
- The 240-volt motor is as single phase, capacitor start, induction motor that is rated at 1-1/8 hp. The motor actually develops more than 1-1/2 hp in use and draws 6 to 8 amps when loaded.
- Figure A-3 diagrams the wiring for the 220/240 volt plugs. The should be connected as follows:

Wires in Wall Socket		220/240 Mark V Plug
WHITE	connects to–	GREEN
BLACK	connects to–	BLACK
RED	connects to–	WHITE

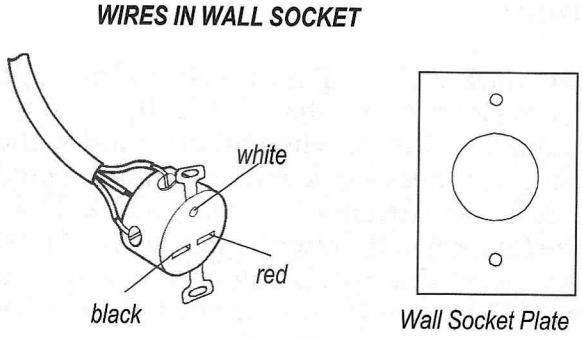

Figure A-3

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Shopsmith Safety Kit

- Four important safety devices are included with your Mark V:

  - Push stick
  - Push block
  - Fence straddler
  - Feather board.

- These devices are designed to hold or maneuver stock close to moving blades, cutters and discs. They give you better control over the stock which helps achieve a more accurate cut. Depending on the operation, use one or more safety devices. Choose the device that gives you the most control and keeps your hands out of danger.

- Use a push stick to guide stock 1-1/2" to 5" wide. Place the foot on top of the stock and hook the heel over the back edge. See Figure A-4.

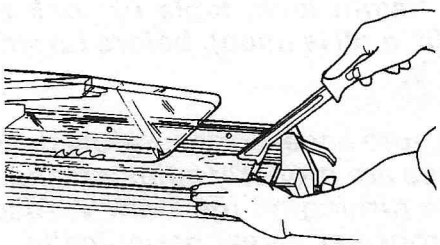

Figure A-4

- Use the push block to hold down and guide stock over 5" wide. As you press down, forward, and to the side, the rubber pad grips the wood. The handle is tilted to help keep your hands away from the blade, cutter or disc, as illustrated in Figure A-5.

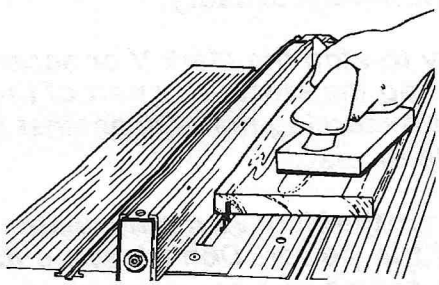

Figure A-5

- Use the fence straddler to hold down and push stock narrower than 1-1/2" past a blade or cutter. The body rides on the rip fence, while the heel hooks over the back edge of the stock. To change the height of the heel, loosen the locking knob. To reverse the heel, rotate the side 180°. Keep the locking knob secure. See Figure A-6.

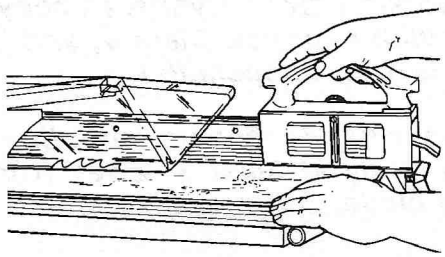

Figure A-6

- Use the feather board to press stock against the rip fence. Mount the feather board in either table slot. The fingers must be angled in the same direction that you feed the stock– use the arrow on top of the feather board as a guide. Position the fingers so they press against the stock just before it gets to the blade or cutter, then tighten the locking knobs. See Figure A-7. To reverse the direction of the fingers, remove the mounting bar, turn the feather board over, then replace the mounting bar.

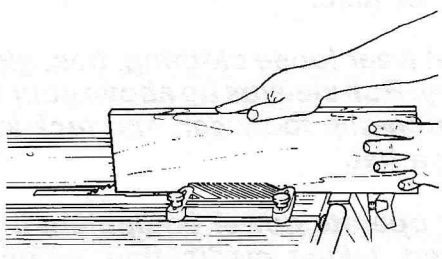

Figure A-7

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Safety Rules for the Shopsmith Mark V

- *Read, understand and follow the Mark V Owner's Manual and the manual for every power tool you use.*
- *Additional warnings, cautions and instructions and operating techniques are provided in the Shopsmith book, Power Tool Woodworking for Everyone. (A copy is included with your new Mark V, and is also available from Shopsmith.)*
- *Keep your hands, fingers and other parts of your body at least 3" away from any moving blade, cutter or disc.*
- *Wear proper eye and ear protection. Also, wear a dust mask.*
- *Ground all equipment (unless double insulated.)*
- *Use clamps, fixtures or the miter gauge to secure stock. When appropriate, use a push stick, push block, fence straddler, feather board, miter gauge with safety grip or other safety devices to maneuver stock past a moving blade, cutter or disc.*
- *Keep all guards in place and in working order. Most injuries occur on unguarded power equipment.*
- *Never stand directly in the line of rotation of a moving blade, cutter, disc.If a kickback occurs, you could be hit by the stock or injured by contacting a moving blade, cutter or disc.*
- *Do not wear loose clothing, ties, gloves, or jewelry. Roll sleeves up above your elbows, wear non-slip footwear, and tuck long hair under a hat.*
- *Never operate power equipment if you are fatigued, taking medication, or under the influence of alcohol or drugs.*
- *Do not work with stock that is too small or too large to handle safely, or that has loose knots or other defects.*
- *Plan the operation and safety precautions before you begin.*
- *Turn off the Mark V and wait until all cutters, blades or discs come to a complete stop before removing stock and scraps.*
- *Turn off and unplug the Mark V before making adjustments, changing modes or performing maintenance.*
- *Make sure the switch is in the "off" position before plugging or unplugging the Mark V.*
- *Secure the headstock lock, carriage lock, table height lock, table tilt lock and quill lock (if quill is used), before turning on the Mark V.*
- *Make sure accessories, safety devices and fixtures are properly adjusted and secured before turning on the Mark V. Also, check the arbor set screw periodically.*
- *Remove adjusting keys and wrenches from the Mark V before turning it on.*
- *Never exceed the maximum recommended speed for the operation. When using "combination" setups (such as table saw–jointer), never exceed the maximum speed for the slowest accessory.*
- *Never try to stop the Mark V or accessory by grabbing the stock, any part of the machine, or by forcing material against a cutter, blade or disc.*
- *Never leave the Mark V running unattended. Turn off the power. Don't leave until the machine comes to a complete stop.*

WARNING WARNING WARNING WARNING

WARNING WARNING

- *Do not overreach or hurry. Keep proper footing and balance at all times.*
- *Never reach under the worktable while the machine is running.*
- *Never use a carbide-tipped blade or cutter to machine second-hand lumber. You could be hit by pieces of metal.*
- *Repair or replace damaged parts before further use. If a strange noise or vibration develops, turn off and unplug the machine. Correct the problem.*
- *Use only recommended Shopsmith parts and accessories on your Mark V. NEVER use non-Shopsmith replacement parts or accessories. They are not designed like Shopsmith parts. Using non-Shopsmith parts may create a hazardous condition and will void your warranty.*
- *Keep all tools, cutters and blades for the Mark V and accessories sharpened.*
- *Keep all hand tools and power tools cleaned and maintained.*
- *Do not use the Mark V or an accessory to do a job for which it was not designed.*
- *Never mount an accessory on an auxiliary spindle unless it is designed to operate there. Consult the accessory's manual for the proper spindle on which to mount the accessory.*
- *Make sure the machine rests firmly on the floor when in use– not up on the retractable casters.*
- *Do not force the stock. Always feed stock against the rotation of the blade, cutter or disc. Let the blade, cutter or disc get up to full speed before you feed the stock.*
- *Make sure the stock rests firmly against the worktable, miter gauge, and/or rip fence.*
- *Do not use warped or twisted stock.*

WARNING WARNING

- *Whenever you extend the quill, do not let go of the quill lever unless you first secure the quill feed lock.*
- *Do not work with long boards or sheet materials by yourself, unless you use a large rear support table or roller stands. Never try to work with boards the are too large for you to handle safely. It is best to have a helper.*
- *Never stand or lean on the machine. You could fall on it or it could tip over.*
- *Keep work areas well lit, clean and free from clutter.*
- *Do not use power equipment in damp, wet or explosive atmospheres.*
- *Keep visitors a safe distance from power equipment, and make them wear eye and ear protection.*
- *Make your workshop "child-proof." Unplug equipment, use padlocks and master switches, and remove switch keys.*

Table Saw Mode

- *Always keep the upper and lower saw guards in place. The ONLY exception is when you saw part way through stock– such as when cutting a rabbet or groove, or when you use the dado or molder accessory. Then you must remove the upper saw guard. However, always keep the lower saw guard in place and work with extreme caution. Use safety devices to move the stock past the unguarded blade. NEVER place your hands over the blade even if the blade is covered by the stock.*
- *The saw blade should never protrude more than 1/4" above the stock.*

To prevent kickback:

- *Never make freehand cuts.*

WARNING WARNING WARNING WARNING

WARNING WARNING WARNING WARNING

- *Never reach over the saw blade while the machine is running.*
- *Keep blades sharp, properly set and free of pitch.*
- *Avoid cutting wet or pitchy wood.*
- *When cross cutting, always use the miter gauge with the safety grip.*
- *If you use the rip fence with the miter gauge, always clamp a stop block to the rip fence.*
- *When ripping, always use the rip fence and make sure that it is parallel to the blade.*
- *When beveling, always mount the rip fence or the miter gauge on the downward side of the worktable.*
- *Always cut with the smooth, hard surface of the stock against the worktable.*
- *Make sure that the splitter (for Model 500) or the riving knife (for Model 510/520) on the saw guard system is properly aligned with the saw blade, and the pawls (for Model 500) are sharp.*
- *Do not rip large sheets of plywood or similar materials by yourself. Get at least one helper.*
- *Use only 10" saw blades with the Mark V. The only exceptions are Shopsmith-recommended molding heads and dado blades.*
- *Always use the proper table insert for the operation.*
- *Always install the upper saw guard so that the riving knife is very close (1/8") to the saw blade.*
- *Never place the miter gauge in the left side of the worktable when the worktable is set to 45°. The saw blade could cut into the miter gauge.*
- *Never operate the table saw at higher than recommended speeds.*

Disc Sander Mode

- *Maintain a 1/16" maximum clearance between the worktable and the disc. The one exception is when you use the quill to advance the disc. Then maintain a 1/2" maximum clearance.*
- *Always use a table to support the stock. Never sand freehand.*
- *When using the quill feed to advance the disc, back up the stock with the rip fence. If the stock is too long to back up, clamp the stock to the worktable. Also, attach the quill feed lever to the side of the headstock where it can be reached without reaching over the disc.*
- *Do not turn on the power withthe stock laying on the worktable or already in contact with the disc.*
- *Always sand on the downward motion-side of the disc.*
- *Do not sand the end grain of stock wider than 5-1/2". The rotation of the disc may lift the stock off the table.*
- *Never operate the disc sander at a higher than recommended speed.*

Vertical Drill Press and Horizontal Boring Modes

- *Keep your hands away from the bit when you advance the quill.*
- *NEVER leave the key in the chuck. Remove the key from the chuck IMMEDIATELY after securing the bit.*

WARNING WARNING WARNING WARNING

WARNING WARNING

- *Never wear jewelry, gloves, ties, loose clothing or clothing with longs sleeves. Keep long hair tucked under a hat. Jewelry, gloves, ties, clothing and hair could become entangled in the bit.*
- *Position the worktable at mid-chest level whenever possible.*
- *Use the rip fence as a backstop and hold the stock firmly against both the worktable and the fence. If you can't use the rip fence, use the miter gauge or clamp the stock to the worktable.*
- *Use only accessories and bits designed to be mounted in power drills.*
- *Never drill or bore metal freehand. Always clamp the metal to the worktable and back-up stock, or the rip fence and back-up stock.*
- *Never use the drill at a higher than recommended speed.*

Lathe Mode

- *When turning glued up stock, make sure glue joints are strong. Glue the stock and leave it clamped for at least 24 hours prior to turning.*
- *Never wear jewelry, gloves, ties, loose clothing or clothing with long sleeves. keep long hair tucked under a hat. Jewelry, gloves, ties, clothing and hair could become entangled in the stock.*
- *Do not turn stock with splits, loose knots, or other defects that could cause the stock to break, splinter, or come loose when turning.*
- *Cut stock that is larger than 3" x 3" into an octagon. This removes excess stock and makes turning safer and easier.*

WARNING WARNING

- *When mounting stock between the centers, the spurs of the drive center and the cup of the cup center must penetrate at least 1/16" into the stock. Do not use a center if the point is damaged. The stock could be thrown from the lathe.*
- *Wax or soap the end of the stock that mounts to the cup center. This lubrication helps keep the cup center from wearing into the stock and causing the stock to loosen on the lathe.*
- *When mounting stock to a faceplate, use #12 x 1-1/4" long screws. The screws must penetrate at least 3/4" into the stock. If the screws are being driven into the end grain, the screws must penetrate at least 2" into the stock. Use #12 x 2-1/2" long wood screws before mounting, to minimize imbalance by cutting the stock round.*
- *Position the tool rest no more than 1/4" from the stock. Maintain this distance while turning. Before turning on the machine, rotate the stock by hand to make sure it clears the tool rest. Never turn without the tool rest.*
- *During turning, periodically turn off the machine and check to make sure the stock remains securely mounted.*
- *Do not lean across or reach underneath the lathe while it is running.*
- *Do not touch the rotating stock while the tool rest is mounted.*
- *Round all stock at "Slow" speed.*
- *Feed the tool ever slowly into the stock. Hold the tool firmly in both hands and against the tool rest.*
- *Never try to stop the lathe by grabbing the stock or any part of the machine.*
- *Do not part the stock completely or turn the spindle down to such a small diameter that it snaps.*

WARNING WARNING

- *Always remove the tool rest before sanding the turned stock on the lathe.*
- *When turning heavy stock, use the center post position on the tool rest arm.*
- *Balance and round all heavy stock at "Slow" speed. Then turn the heavy stock at a very low speed. There is a risk that heavy stock can be thrown from the lathe, so do not place yourself in the plane of the heavy stock's rotation.*
- *Never use the lathe at a higher than recommended speed.*

NOTES

How to Use This Section of the Mark V Model 520

This section contains the information you will need to assemble and align your Model 520. Before you proceed, however, you must read the **Introduction** and **Safety** sections located in the first part of this manual.

After you have read the **Introduction** and **Safety** sections, get familiar with the various terms listed in the **Terms to Know**, starting on page B-2. These terms will be used throughout this manual and the text, **Power Tool Woodworking for Everyone**. Then become familiar with the **Specifications** for your Model 520, found on page B-4.

Starting on page B-5, you will find both the **Parts Lists and Exploded Views** of the Model 520 and standard accessories. Notice the Reference Numbers. The **Assembly** and **Alignment** instructions have reference numbers in parentheses so you can better identify which part is being used and how it fits with the other parts.

NOTE

The floating extension table, connector tubes and telescoping legs which come with the Model 520 have their own parts list and instructions. Refer to that product literature for safety, assembly, alignment and operation information.

After you have looked over the Parts Lists and Exploded Views, you are ready to assemble and align the Model 520. We strongly recommend that you do the steps in order. If you have a problem in assembling or aligning your Model 520, contact your Shopsmith Store or Customer Service, and we will be glad to help. The telephone number for our Customer Services Department is 800/762-7555.

After you have assembled and aligned your Model 520, go through the various **Mode Setups** and get familiar with what each one requires for safe and efficient operation. When you have read the **Introduction** and **Safety** sections and are familiar with the **Terms to Know**, **Parts Lists**, **Exploded Views**, plus have completed the **Assembly and Alignment** procedures, go to the tabbed **Operations** section for more specific information on each of the mode setups and capabilities.

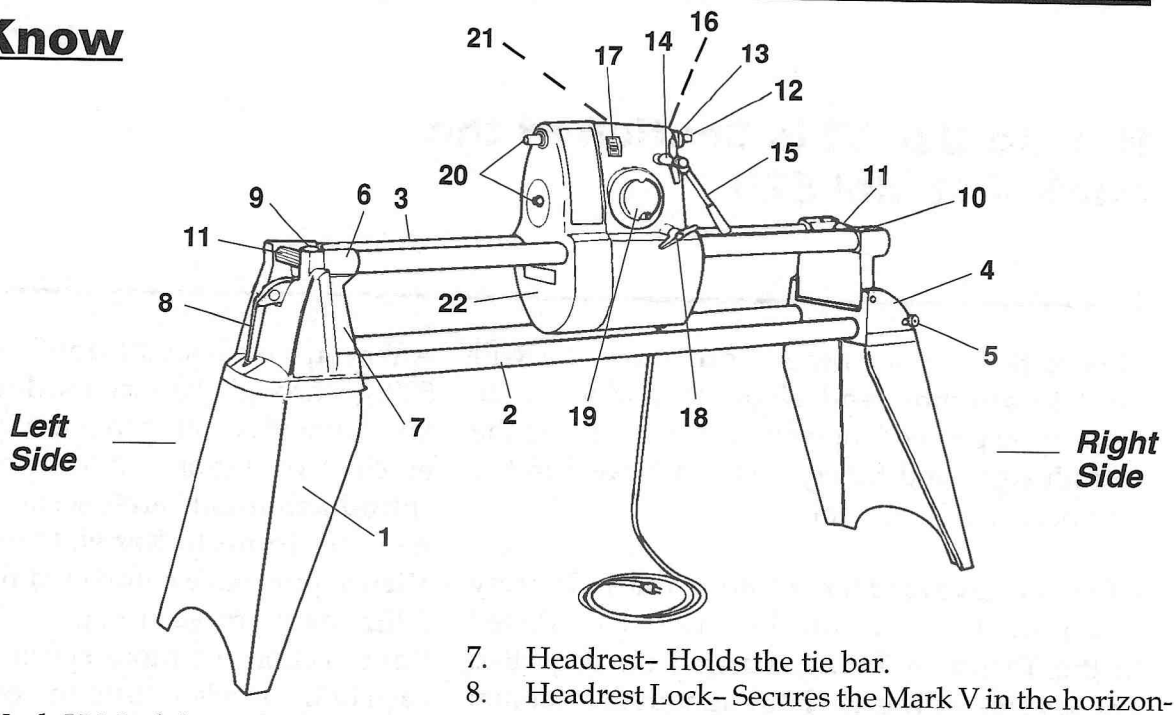
Table of Contents

Terms to Know B-2
Specifications B-4
Parts Lists and Exploded Views B-5
- Bench B-5
- Headstock B-6
- Worktable B-8
- Carriage B-9
- Upper & Lower Saw Guards B-10
- Rip Fence B-11
- Extension Table B-11
- Miter Gauge & Safety Grip B-12
- Miscellaneous Accessories B-13

Assembly B-15
Alignment B-22
Mode Setups B-38
- Worktable B-39
- Accessories B-40
- Table Saw Mode B-41
- Disc Sander Mode B-42
- Vertical Drill Press Mode B-42
- Horizontal Boring Mode B-43
- Lathe Mode B-44

Optional Setups with Floating Extension Tables, Connector Tubes and Telescoping Legs B-46

Terms to Know



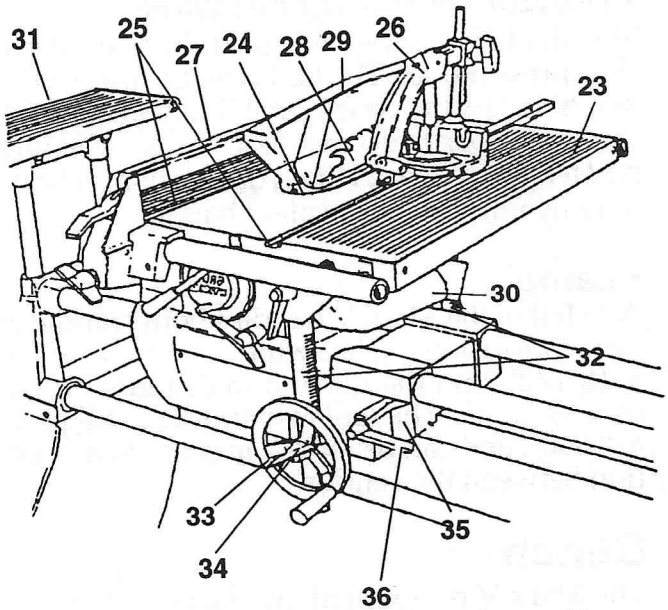
The Shopsmith Mark V Model 520 will perform all the functions of a table saw, disc sander, drill press, horizontal boring machine, and wood lathe.

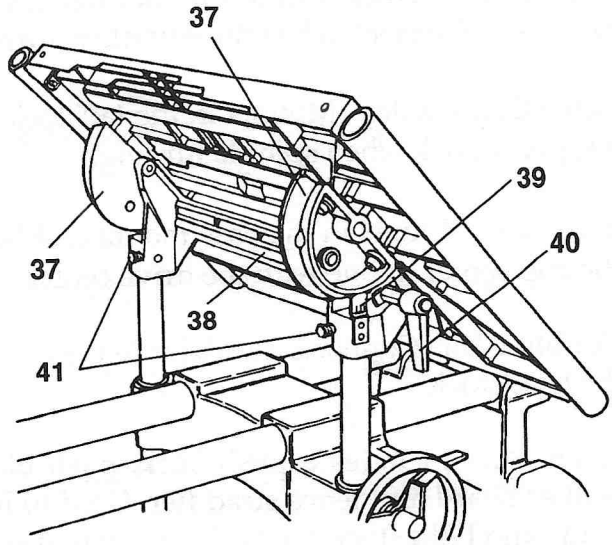
Basically, the Mark V is a rigid bench that holds the headstock and the worktable system. The upper part of this bench can be positioned horizontally or vertically. The headstock and the worktable slide independently and are positioned along the upper tubes.

You can mount accessories to the headstock and operate them at different speeds. The worktable can be positioned over, under or beside these accessories to hold stock at various angles. In this way, the bench, headstock, worktable, and accessories combine to make a unique, capable and versatile woodworking system.

Before you proceed, familiarize yourself with the Mark V's basic parts:

1. Legs -- Support the way tubes and bench tubes.
2. Bench Tubes - Hold the Mark V rigid.
3. Way Tubes - Allow the headstock and carriage to slide.
4. Base - Allows the way tubes to pivot to either a horizontal or vertical position.
5. Base Lock- Secures the Mark V in the vertical position.
6. Way Tube Tie Bar- Holds the free end of the way tubes.
7. Headrest- Holds the tie bar.
8. Headrest Lock- Secures the Mark V in the horizontal position.
9. Power Mount- Holds the extension table and the major accessories (Shopsmith Bandsaw, Jointer, Belt Sander, Scroll Saw, Strip Sander and Planer).
10. Base Mount- Holds the extension table and lathe tailstock.
11. Accessory Mount Locks- Secure the extension table, Major Accessories, and the lathe tailstock.
12. Main Spindle- Mounts the saw blades, sanding discs, and other accessories.
13. Quill- Extends and retracts up to 4-1/4".
14. Quill Lock- Secures the quill.
15. Quill Feed Lever- Extends the quill and main spindle out from the headstock.
16. Quill Feed Stop- (hidden from view) Stops the quill at predetermined distances out from the headstock.
17. Power Switch- Turns the Mark V on and off. Has a removable safety key to prevent unauthorized use of the Mark V.
18. Headstock Lock- Secures the headstock on the way tubes.
19. Speed Dial- controls the speed of the main and auxiliary spindles. ONLY turn the speed dial when the Mark V is running. Otherwise, you will damage the speed changing mechanism. Then turn the speed dial to "Slow" after every operation, then turn off the Mark V.
20. Auxiliary Spindles- The upper spindle powers the Bandsaw, Belt Sander, Strip Sander and Thickness Planer. The lower spindle powers the Jointer and Scroll Saw.
21. Logo Cover- (hidden from view) Allows access to the wiring and speed changer mechanism.
22. Belt Cover- Allows access to the belts and sheaves.





23. Worktable – Holds the stock and provides a working surface.
24. Table Insert– Used for sawing, sanding, drilling and boring. It can be replaced with inserts for dadoing, molding, drum sanding and shaping.
25. Miter Gauge Slots– Guide and secure the miter gauge.
26. Miter Gauge with Safety Grip–Holds stock firmly at various angles. It slides freely or locks in the miter gauge slots.
27. Rip Fence– Mounts to the table and is used as a guide, support or stop. It automatically aligns itself parallel to the blade. Holes in the fence are used to mount fixtures and fence extensions.
28. 10" Saw Blade–Mounts to the 1-1/4" arbor which then mounts to the main spindle. This saw blade is use for both crosscutting and ripping.
29. Upper Saw Guard– Provides a physical barrier between you and the part of the blade above the table. An anti-kickback mechanism helps control kickbacks.
30. Lower Saw Guard–Protects you from the part of the blade or cutter below the table. The saw guard has a dust chute. The lower saw guard is also used with the sanding disc.
31. Extension Table– Mounts in either the power mount or the base mount to provide extra support for the stock.
32. Table Support Tubes– Support the table above the bench. Each tube has racks that mesh with pinions in the carriage to raise and lower the table.
33. Table Height Crank– Turns the pinions in the carriage which raise and lower the table.
34. Table Height Lock– Secures the table at any height.
35. Carriage– Slides along the way tubes and holds the table support tubes and the lathe tool rest.
36. Carriage Lock– Secures the carriage on the way tubes.
37. Trunnions– Allows the table to tilt up to 90° left and 45° right.
38. Table Tie Bar– Supports the table support tubes and the trunnions.
39. Table Tilt Indicator– This vernier scale indicates the table angle.
40. Table Tilt Lock–Secures the table at any angle, up to 90° left and 45° right.
41. Table Stops–When properly adjusted, these bolts stop the table at 90° left, 45° right and 0°. (Note: the two 90° table stop bolts are shown.)

The following accessories come with the Mark V, but are not shown on the illustrations. Refer to the PARTS LISTS to identify them.

Sanding Disc– Mounts to the main spindle and is used for disc sanding.

Drill Chuck and Key–Mounts to the main spindle. The key locks the bit in the chuck.

Lathe Tool Rest Assembly– Mounts in the carriage to support and guide lathe chisels. It has two mounting positions.

Lathe Drive Center– Mounts to the main spindle and turns the stock when the spindle is turning.

Lathe Cup Center– Mounts in the tailstock and supports stock when spindle turning.

Tailstock– Mounts in the base mount and holds the cup center in line with the drive center.

Coupling Kit– Connects the Major Accessories to the headstock.

Safety Kit– Includes a push stick, push block, feather board and fence straddler. Used to help guide and hold stock safely during operations.

Goggles– For protection of your eyes. To be worn during all operations.

Arbor Wrench and Allen Wrenches– Used for alignment, adjustment and to mount accessories.

Specifications

The specifications of the Shopsmith Mark V will give you an idea of its capabilities—

Capacities

The work capacity of the Mark V depends on these five modes:

• Table Saw

As a table saw, the Mark V accepts 10" saw blades. The maximum depth of cut at 0° is 3-1/4". With the table tilted at 45°, the maximum depth of cut is 2-3/8".

• Disc Sander

As a disc sander, the Mark V mounts a 12" diameter sanding disc, giving you 113 square inches of sanding surface. The size of stock that you can sand is limited only by what you can safely handle.

• Drill Press

As a drill press, the Mark V used a chuck that accepts drill bits with shanks 5/64" to 1/2" in diameter. The throat capacity is 8-1/4", enabling you to drill the center of a 16-1/2" circle. With a 5-1/2" long bit mounted in the chuck, the maximum distance from the bit to the table is 22". If you remove the table, the maximum distance from the bit to the floor is 54".

• Horizontal Boring Machine

The Mark V uses the same drill chuck used in the drill press mode. The table can be lowered 2-3/8" below the chuck, enabling you to bore the center of boards up to 4-3/4" thick. The width and length of boards that you can bore is limited only by what you can safely handle.

• Lathe

As a lathe, the Mark V handles both spindle and faceplate turning. The swing over the way tubes is 16-1/2", and the maximum distance between centers is 34". The tool rest and arm will pivot a full 360°, and can be locked in place in any position between the centers.

Bench

The Mark V is mounted on two steel legs and is held rigid by four steel tubes. The two upper tubes, or way tubes, can be locked in either a horizontal or vertical position.

Headstock

The Mark V is powered by a 1-1/8" hp motor. This turns three spindles– one main spindle and two auxiliary spindles. All three spindles revolve on permanently-lubricated, sealed ball bearings.

Speed

A system of variable-diameter pulleys makes it possible to adjust the speed of the main and upper auxiliary spindle from 700 rpm to 5,200 rpm. The lower auxiliary spindle turns 1.6 times faster than the other two, or between 1,120 rpm and 8,320 rpm.

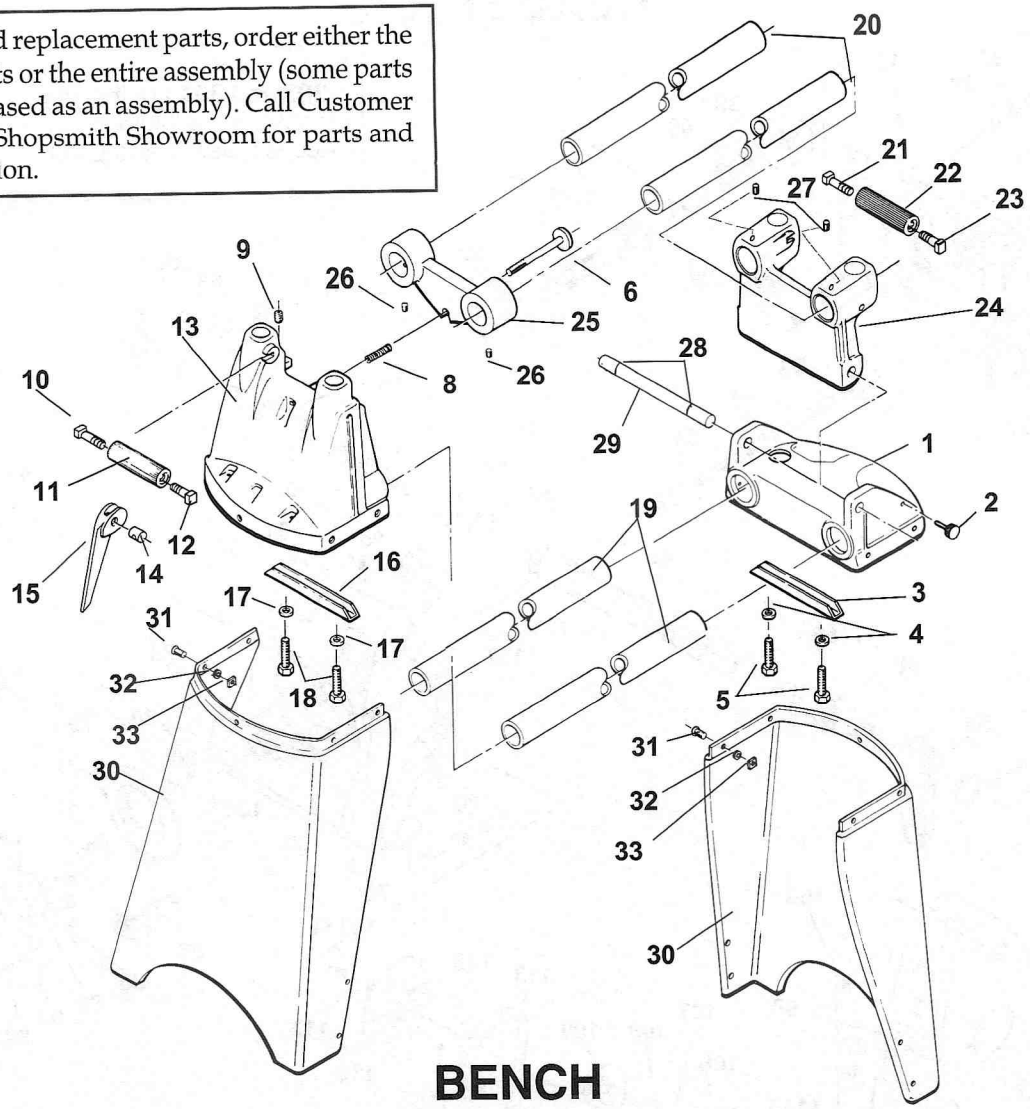
Worktable

The Mark V Model 520 worktable is made of die-cast aluminum grooved and machined smooth. It can be tilted from 90° left to 45° right, and raised from 2-3/8" below the center of the main spindle to 8-1/4" above it with the work angle set at 0°.

Overall Dimensions of the Mark V Model 520

Overall, the Mark V is 71" long, 25-1/2" wide, and 46-1/2" high in the table saw mode, or 76-1/4" high in the drill press mode.

When you need replacement parts, order either the individual parts or the entire assembly (some parts must be purchased as an assembly). Call Customer Service or the Shopsmith Showroom for parts and price information.



BENCH

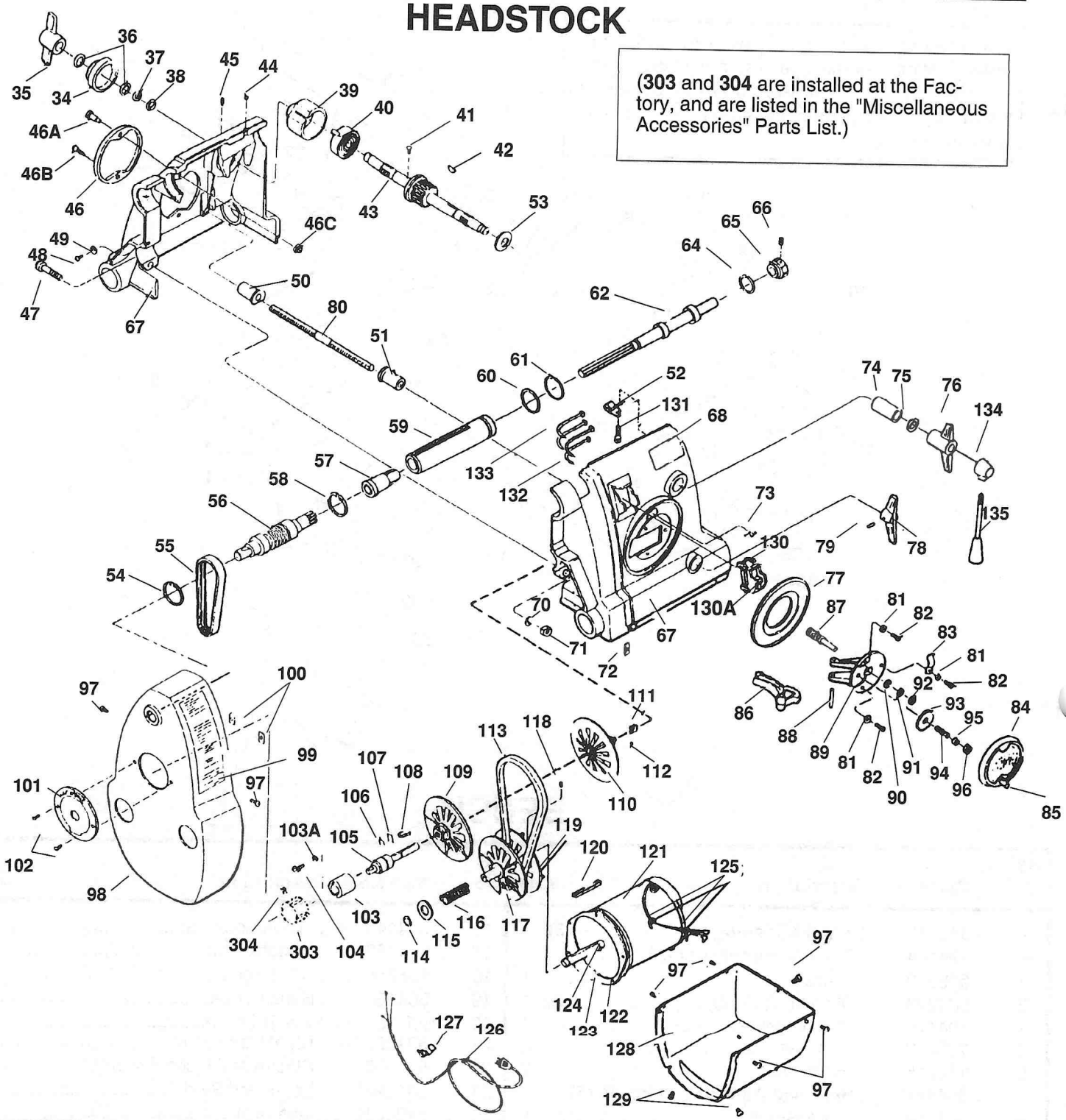
Ref. No.	Part No.	Description	Qty.
–	**513618**	**Bench Assembly (incl. 1-19, 21-23)**	
–	**504144**	**. Base Assembly (incl. 1-5)**	
1	518379	. . Base	1
2	504293	. . Arm Lock Knob	1
3	504146	. . Tube Lock Bar	1
4	120382	. . Washer	2
5	138245	. . Hex Bolt	2
–	**504148**	**. Headrest Assembly (incl. 6-18)**	
6	504158	. . Lock Shaft	1
7	not used		
8	504161	. . Lock Spring	1
9	504153	. . Hex Socket Setscrew	1
–	**501286**	**. . Accessory Mount Lock Assembly (incl. 10-12 or 21-23)**	
10	501293*	. . . Left-Hand Stud	1
11	514659*	. . . Sleeve and Insert Assembly	1
12	501290*	. . . Right-Hand Stud	1
13	517768	. . Headrest	1
14	504157	. . Cam Pin	1
15	5041569	. . Headrest Handle	1

Ref. No.	Part No.	Description	Qty.
16	504146	. . Tube Lock Bar	1
17	120382	. . Washer	2
18	138245	. . Hex Bolt	2
19	504163	. Bench Tube	2
20	501193	Way Tube	2
21	501290*	. Right Hand Stud	1
22	514659*	. Sleeve and Insert Assembly	1
23	501293*	. Left-Hand Stud	1
24	518381	Base Arm	1
25	50426401	Way Tube Tie Bar (incl. 26)	1
26	502051	Cup Point Setscrew	2
27	502051	Cup Point Setscrew	2
28	517642	Retaining Ring	2
29	518378	Base Arm Pin	1
30	50416201	Leg	2
–	**516076**	**510/ 520 Hardware Pack (incl. 31-33)**	
31	518114	. Truss Head Screw	10
32	115546	. Lock Washer	10
33	120372	. Square Nut	10

*** Not available as a service part.**

HEADSTOCK

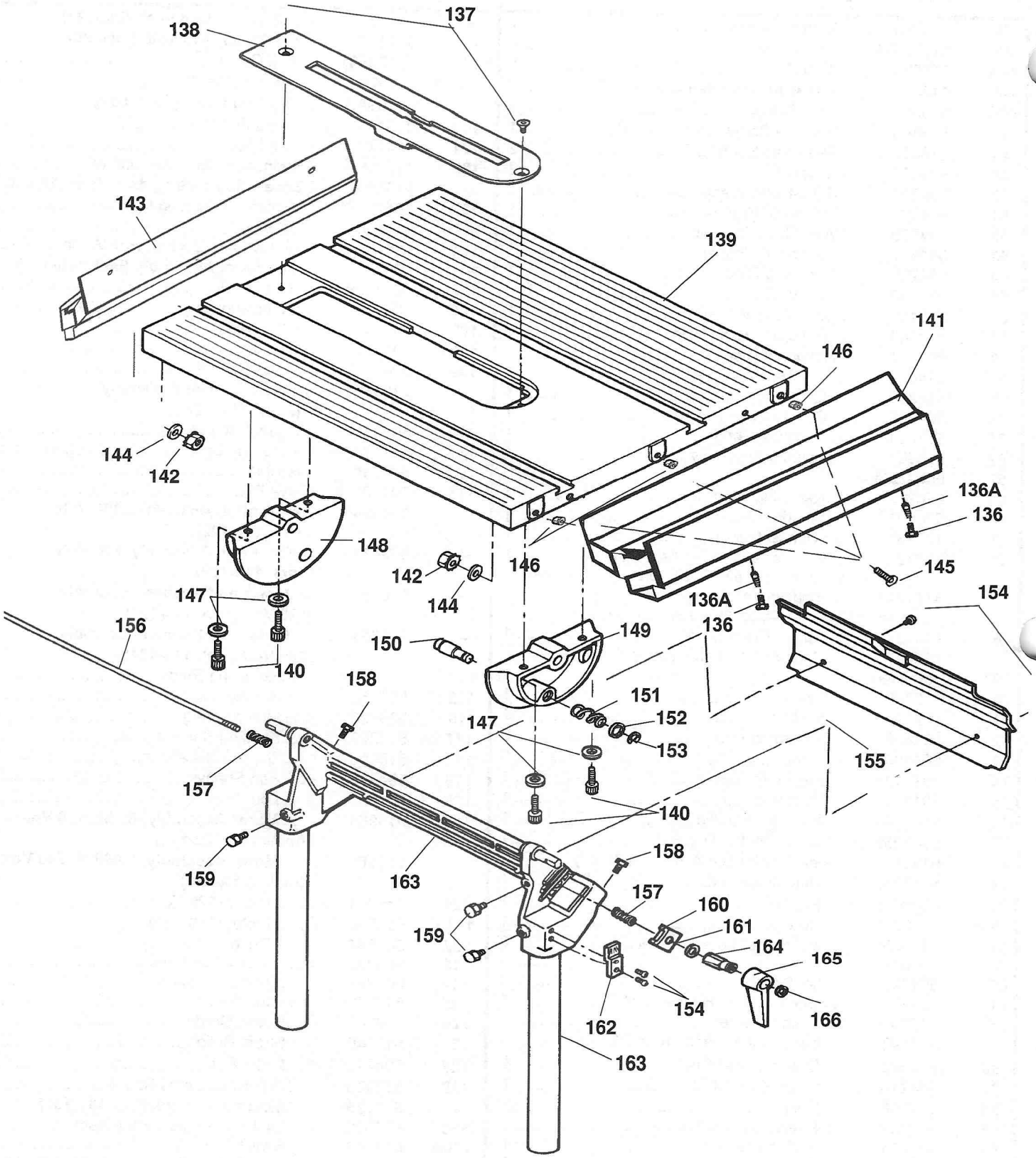
(303 and 304 are installed at the Factory, and are listed in the "Miscellaneous Accessories" Parts List.)



Ref. No.	Part No.	Description	Qty.
–	516903	**Headstock Assembly, 60 hz. 120 Volt, Domestic (incl. 34-135)**	
–	516904	**Headstock Assembly, 60 hz. 120 Volt Canadian (incl. 34-135)**	
–	516907	**Headstock Assembly, 60 hz. 240 Volt Domestic (Incl. 34-135)**	
–	516906	**Headstock Assembly, 50 hz. 240 Volt European (incl. 34-135)**	
–	504171	**. Quill Feed Assembly (incl. 34-43)**	
34	5013149	. . Feed Stop	1
35	5041729	. . Feed Stop Handle	1
36	501311	. . Serrated Washer	2
37	501627	. . Washer	1
38	501626	. . Retaining Ring	1
39	501310	. . Spring Housing	1
40	501315	. . Quill Spring	1
41	145378	. . Drive Screw	1
42	110731	. . Woodruff Key	1
43	501312	. . Quill Feed Pinion	1
44	501634	. Setscrew	1

Ref. No.	Part No.	Description	Qty.
45	513056	. Allen Setscrew	1
46	51372304	. Logo Cover	1
46A	516531	. Pivot Pin	1
46B	449613	. Screw, Phllips Head, 8-32 x 3/8"	1
46C	516536	. Push Nut	1
47	516895	. Machine Screw, 5/16 x 1-3/4"	1
48	448027	. Pan Head Screw	2
49	501630	. Washer	2
50	504234	. Right-Hand Wedge Lock	1
51	504235	. Left-Hand Wedge Lock	1
52	514779	. Wire Retaining Clip	1
53	501317	. Spherical Washer	1
54	501299	. Retaining Ring	1
55	504170	. Poly V-Belt	
56	518145	. Drive Sleeve Assembly (incl. 57)	1
57	514083	. . Drive and Ring Assembly	1
58	501621	. Retaining Ring	1
–	514071	. Quill Assembly (incl. 59-66)	
59	518208	. . Quill Housing	1
60	501307	. . Quill Bumper Ring	1
61	501624	. . Retaining Ring	1
62	518207	. . Spindle Assembly	1
63	not used		
64	518209	. . Retaining Ring	1
65	518204	. . Spindle Knob	1
66	102581	. . Allen Setscrew	1
67	517123	. Headstock Housing Asm (Dom/Euro Incl. 46-46C, 52, 68, 99, 103A, 130-133, 189)	1
–	517124	. Headstock Housing Asm (Can Incl. 46-46C, 52, 68, 99, 103A, 130-133, 189)	
68	516627	. . Speed Chart Label	1
–	517093	. . Speed Chart Label (Canadian)	
69	not used		
70	120379	. Washer	1
71	102634	. Hex Nut	1
72	501656	. Tinnerman Clip	6
73	504196	. Spring	1
74	501318	. Quill Feed Sleeve	1
75	501631	. Washer	1
76	5041769	. Quill Lock Handle	1
77	5042259	. Speed Control Dial	1
–	513014	. Headstock Lock Asm. (incl.78-80)	
78	5042369*	. . Headstock Lock	1
79	455862*	. . Rollpin	1
80	504233*	. . Rod	1
81	115545	. Shakeproof Lock Washer	3
82	448027	. Screw	3
83	504228	. Dial Spring	1
84	504229	. Speed Control Handle (incl. 85)	1
85	145709	. . Allen Setscrew	1
–	504198	. Speed Control Asm. (incl. 86-96)	1
86	504221	. . Quadrant Assembly	1
87	504216	. . Worm Control Shaft	1
88	457008	. . Rollpin	1
89	513700	. . Speed Control Bracket	1
90	513089	. . Spring Washer	1
91	501640	. . Washer	1
92	504217	. . Retaining Ring	1
93	504220	. . Idler Gear	1
94	51398905	. . Setscrew	1
95	504219	. . Idler Bushing	1
96	124818	. . Jam Nut	1
97	513608	. Pan Head Screw	7
–	**514152**	**. Belt Cover (incl. 98-102)**	**1**
–	**514153**	**. Belt Cover, Canadian (incl. 99)**	
–	**514155**	**. Belt Cover, 240 Volt (incl. 99)**	
98	50423801	. . Belt Cover	1
99	516626	. . Warning Label	1
–	517094	. . Warning Label (Canadian)	
100	445124	. Spring Flat Nut	2
101	514471	. Vent Plate	1
102	132696	. Roundhead Machine Screw	2
–	**515616**	**. Eccentric Bushing Asm. (Incl. 103-104)**	
103	5041909*	. . Eccentric Bushing Mach.	1
103A	501616	. . Washer	1
104	515615	. . Screw, #6-32 x 3/8" Hex Washer Hd.	1
–	**504177**	**. Idler Shaft Assembly (incl. 105-113)**	
105	5041789	. . Idler Shaft	1
106	504179	. . Retaining Ring	1
107	504189	. . Sheave Clip	1
108	501320	. . Short Key	1
109	5041809	. . Idler Sheave	1
–	**515556***	**Control Sheave Assembly (incl. 110-112)**	
110	504181*	. Control Sheave	1
111	504187	. Retaining Loop	1
112	513734	. Rollpin	1
113	504193	Drive Belt	1
–	**504194**	**. Motor Pan Assembly, 120 Volt (incl. 114-129)**	
–	**513617**	**. Motor Pan Assembly, 240 Volt (Incl. 114-129)**	
–	**516152**	**. . Motor and Sheave Assembly, 120 Volt (incl. 114-124)**	
–	**513614**	**. . Motor and Sheave Assembly, 240 Volt (incl. 114-124)**	
114	501645	. . . Retaining Ring	1
115	504553	. . . Washer	1
116	509226	. . . Motor Spring	1
117	504208	. . . Floating Sheave	1
118	513056	. . . Cup Point Setscrew	1
119	504207	. . . Fan Sheave	1
120	504209	. . . Long Key	1
–	**513964**	**. . . Motor Assembly, 60 hz, 120 Volt (incl. 121, 122-124)**	**1**
–	**513968**	**. . . Motor Assembly, 50/60 hz,240 Volt (incl. 121A-124)**	
121	518241	. . . . Motor (120 Volt)	1
121A	513060	. . . . Motor (240 Volt)	
122	504341	. . . . Drive Screw	5
123	504206	. . . . Motor Fan Plate	1
124	504205	. . . . Sheave Spacer	1
125	518679	. . Wire Tie	2
126	518242	. . Power Cord	1
127	513740	. . Strain Relief	1
128	50421201	. . Motor Pan	1
129	515426	. . Pan Head Sems Screw	4
–	**517125**	**. Switch Serv Pack (Incl 130-131)**	
130	516532	. . Locking Toggle Switch Asm.	1
130A	517143	. . Switch Key	1
131	517382	. . Hex Wshr Hd. Mach Srw #8-32 x 3/8",	1
132	518302	. Jumper Wire, white	1
133	518303	. Connector Wire, black	2
–	**513682**	**Lever and Hub Asm. (incl.134,135)**	
134	5041739	. Quill Feed Hub	1
135	513017	. Quill Feed Handle	1
136	not used		

* Not available as a service part.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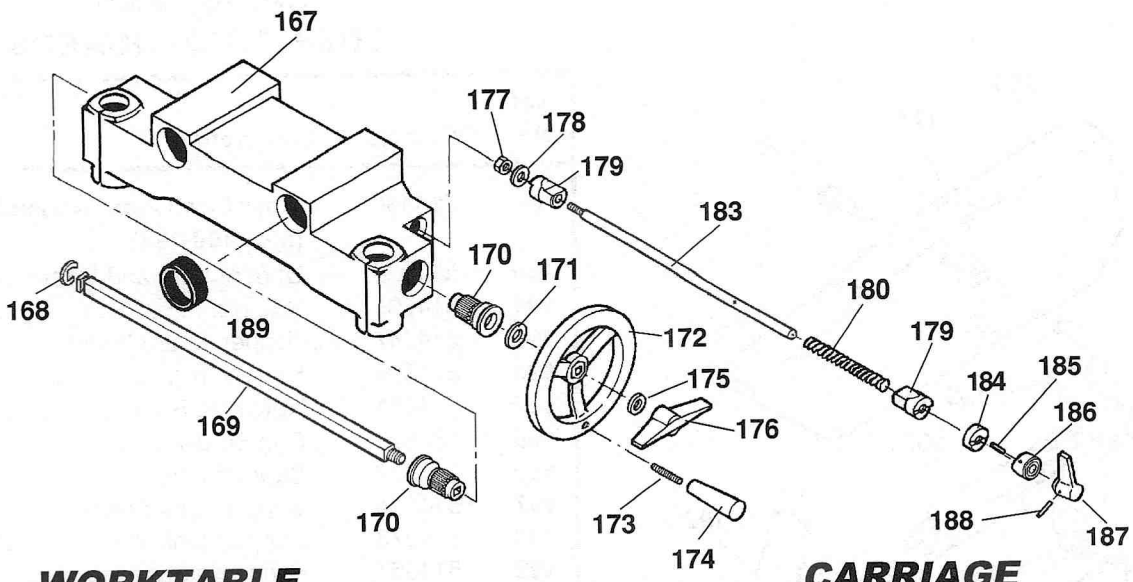


WORKTABLE

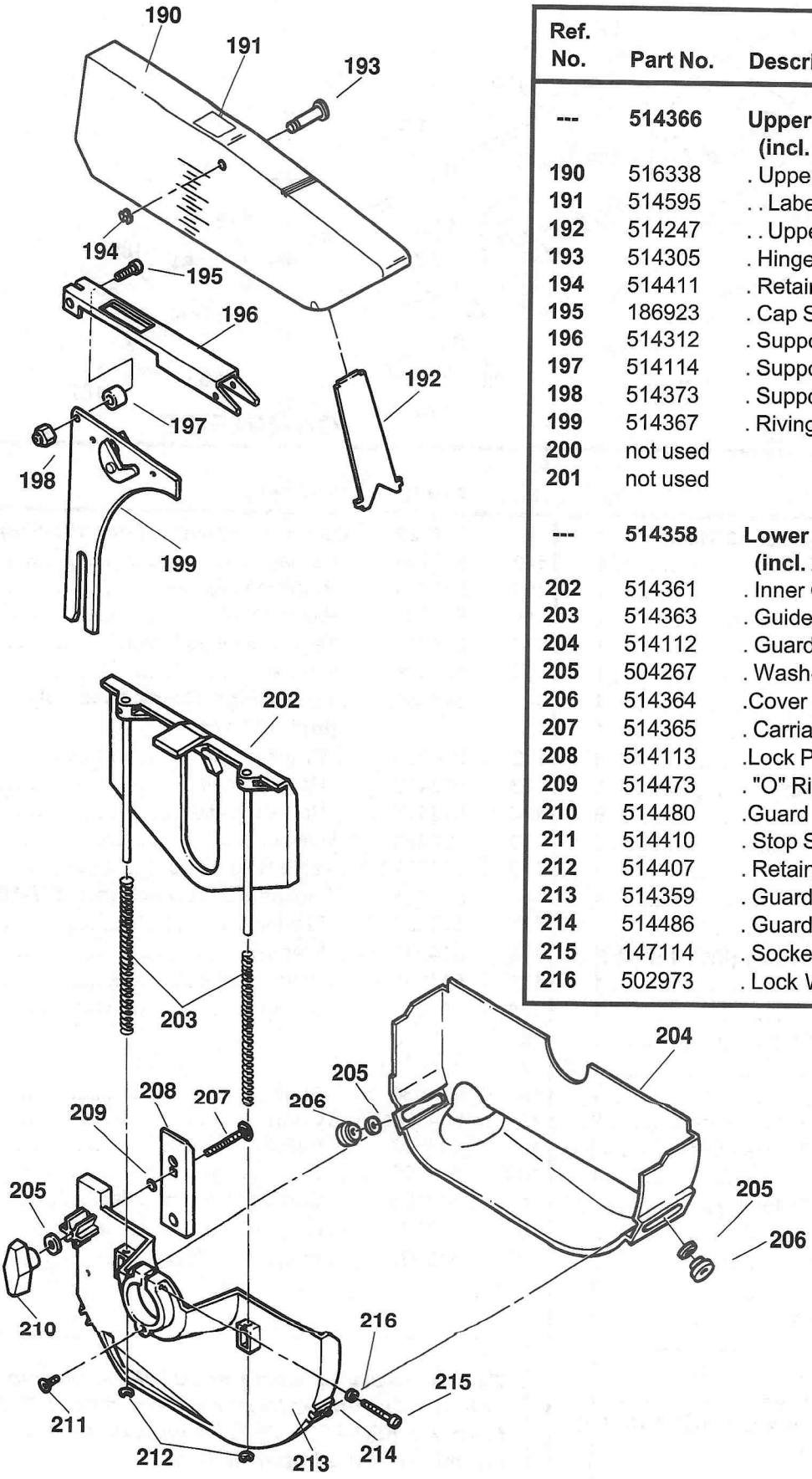
Ref. No.	Part No.	Item Description	Qty
–	**518421**	**Table Assembly (Incl. 136-166)**	
136	515859	. Knob	4
136A	518462	. Spring	4
137	501637	. Hex Socket Head Screw	2
138	51410004	. Table Insert (Center Saw)	1
139	51409702	. Table (Incl. 98)	1
140	514351	. . Taptite Screw	4
141	518488	. Front Rail Assembly	1
142	515294	. Keps Nut	6
143	518490	. Rear Rail Assembly	1
144	120392	. Flat Washer	6
145	518460	. Flat Head Screw	6
146	518403	. Table Spacer	6
147	501633	. Washer	4
148	514620	. Rear Trunnion	1
–	**514339**	**. Front Trunnion Assy (Incl. 149-153)**	
149	514130	. . Front Trunnion	1
150	514340	. . Table Stop Pin	1
151	514341	. . Compression Spring	1
152	514466	. . Washer	1
153	514342	. . Retaining Ring	1
154	517829	. . Button Head Socket Screw	2
154A	514040	. . 10-24 x 5/16" Phil Pan Screw	2
155	514115	. Tie Bar Guard	1
156	514634	. Rod and Shoe Assembly	1
157	514353	. Shoe Spring	2
158	518372	. Table Stop Bolt	2
159	514350	. Table Stop Bolt	3
160	514104	. Front Clamp Shoe	1
161	120393	. Washer	1
162	514311	. Indicator Plate	1
163	514344	. Table Bar and Tube	1
–	**514448**	**. Tbl Lock Handle Assy (Incl. 164-166)**	
164	514447	. . Table Lock Nut	1
165	5042559	. . Table Tilt Lock	1
166	502680	. . Retaining Ring	1

CARRIAGE

Ref. No.	Part No.	Description	Qty.
–	**514328**	**Carriage Assembly (incl. 167-188)**	
167	514209	. Carriage	1
168	504259	. Retaining Washer	1
169	514329	. Pinion Shaft	1
170	514211	. Table Elevating Pinion	2
171	120396	. Washer	1
–	**514330**	**. Table Height Crank Assembly (incl. 172-174)**	
172	514334	. . Crank and Insert	1
173	513418	. . Handle Shaft	1
174	513417	. . Crank Handle	1
175	120388	. Washer	1
176	5042629	. Table Height Lock	1
–	**514335**	**. Carriage Lock Asm. (incl. 177-188)**	
177	443334	. . Flexloc Nut	1
178	514237	. . Washer	1
179	514095	. . Wedge Lock	2
180	515271	. . Spring	1
181	not used		
182	not used		
183	514336	. . Shaft	1
184	514526	. . Cam	1
185	514527	. . Rollpin	1
186	514096	. . Cam Wedge	1
187	514126	. . Carriage Lock Handle	1
188	455734	. . Rollpin	1
189	516667	Carriage Stop Ring	1

To order service parts or supplies, please call our Customer Service Department Toll Free @ 1-800-762-7555. Or visit us at our website www.shopsmith.com

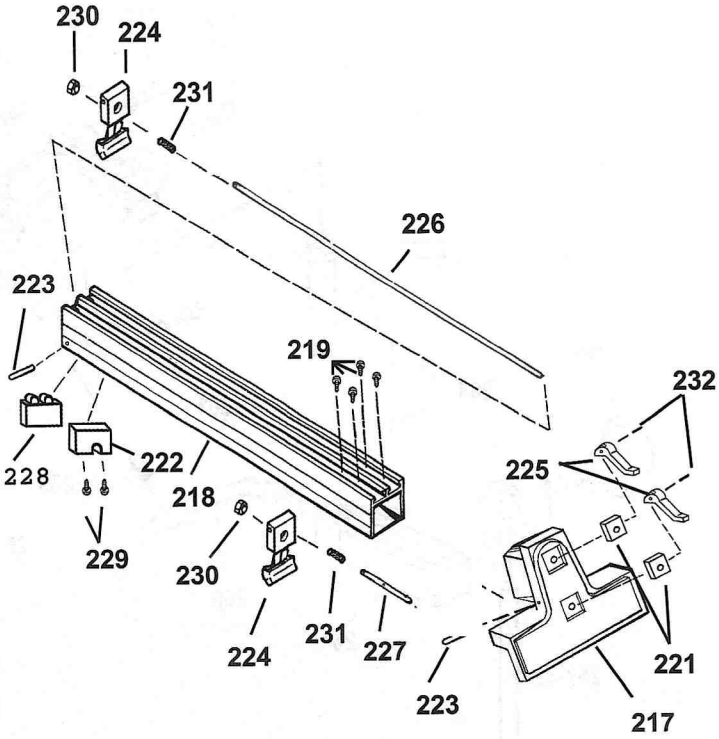
UPPER AND LOWER SAW GUARDS



Ref. No.	Part No.	Description	Qty.
---	514366	**Upper Saw Guard Assembly (incl. 190-199)**	
190	516338	. Upper guard and Insert	1
191	514595	. . Label	1
192	514247	. . Upper Guard Insert	1
193	514305	. Hinge Pin	1
194	514411	. Retaining Ring	1
195	186923	. Cap Screw	1
196	514312	. Support Link	1
197	514114	. Support Link Spacer	1
198	514373	. Support Link Hub	1
199	514367	. Riving Knife Assembly	1
200	not used		
201	not used		
---	514358	**Lower Saw Guard Assembly (incl. 202-216)**	
202	514361	. Inner Guard Assembly	1
203	514363	. Guide Rod Spring	2
204	514112	. Guard Cover	1
205	504267	. Washer	3
206	514364	.Cover Lock Knob	2
207	514365	. Carriage Bolt	1
208	514113	.Lock Plate	1
209	514473	. "O" Ring	1
210	514480	.Guard Lock Knob	1
211	514410	. Stop Screw	1
212	514407	. Retaining Ring	2
213	514359	. Guard and Pin Assembly	1
214	514486	. Guard Stud	2
215	147114	. Socket Head Screw	1
216	502973	. Lock Washer	1

PRO FENCE

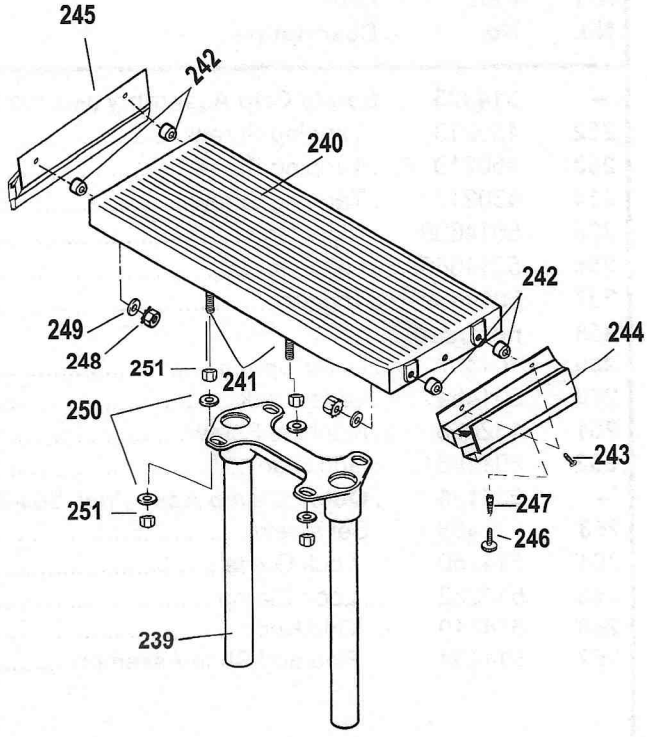
Ref. No.	Part No.	Item Description	Qty.
–	518418	**Pro Fence Assembly** (Incl. 1-17)	
217	518419	. Fence Base	1
218	518400	. Fence Extrusion	1
219	517829	. Screw 1/4-20x1/2 Button Hd	4
220	518404	. Front Pad (not shown)	4
221	514317	. Plate-wear	2
222	518420	. Spring Block	1
223	518405	. Locking Bar Rod	2
224	518407	. Locking Bar	2
225	521578	. Locking Handle	2
226	518410	. Rod-Long	1
227	518409	. Rod-Short	1
228	518423	. Rear Pad	1
229	518461	. Screw #10-24 Flat Hd	2
230	518459	. Lock Nut	2
231	518416	. Spring	2
232	514527	. Rollpin	2
233	not used		
234	not used		
235	not used		
236	not used		
237	not used		
238	not used		

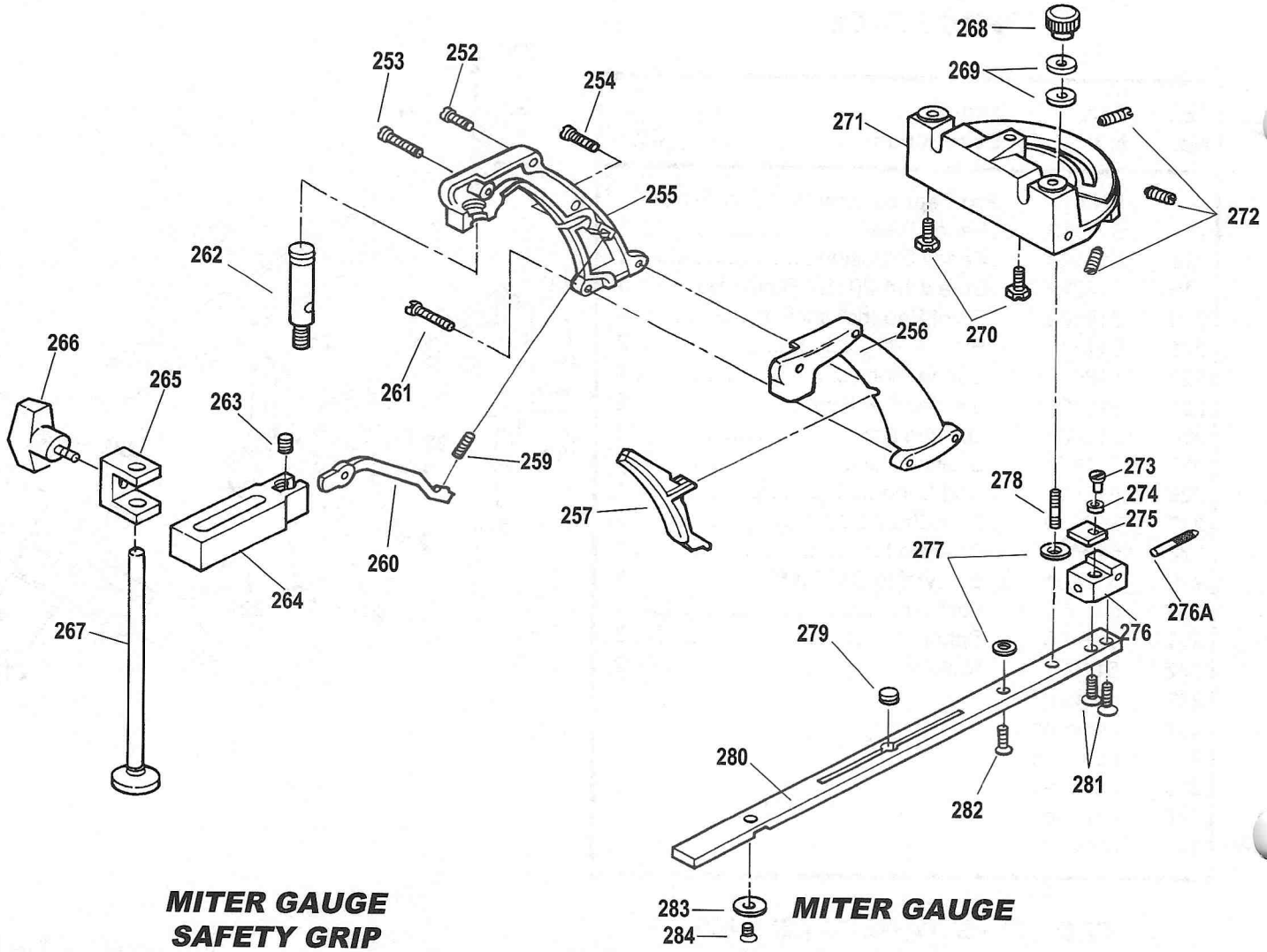


FLOATING TABLES (2) AND EXTENSION TABLE (1)

Ref. No.	Part No.	Item Description	Qty.
–		**Floating Table (Incl. 240,242-249)**	
–		**Ext Table & Base Assy (Incl. 239-251)**	
239	504273	. Extension Table Base	1
–	**516014**	**. Extension Table with Extrusions (Incl. 240-241)**	
–		**. Ext Tbl Assy (Incl. 240-249)**	
240	514107	. . Extension Table	3
241*	515969	. . Table Stud Assembly	4
242	518403	. . Table Spacer	12
243	518460	. . Flat Head Screw	12
244	518489	. . Front Rail Asm. Ext Table	3
245	518491	. . Rear Rail Asm. Ext Table	3
246	515859	. . Knob	6
247	518462	. . Spring	6
248	515294	. . Keps Nut	12
249	120392	. . Flat Washer	12
250	120394	. . Washer	8
251	120377	. . Hex Nut	8

* Not available as a service part.





MITER GAUGE SAFETY GRIP

MITER GAUGE

Ref. No.	Part No.	Item Description	Qty
–	**514375**	**Safety Grip Assembly** (Incl. 252-267)	
252	450213	. Tapping Screw	1
253	450219	. Tapping Screw	1
254	450217	. Tapping Screw	1
255	5014699*	. Right Grip	1
256	5014689*	. Left Grip	1
257	5014659*	. Trigger	1
258	**not used**		
259	501467	. Lever Spring	1
260	501464	. Lever Lock	1
261	132066	. Machine Screw	1
262	501466	. Grip Stud	1
–	**555125**	**. Quick Clamp Assy (Incl. 263-267)**	
263	222458	. Set screw	1
264*	514250	. . Lock Guide	1
265	514252	. . Lock Clamp	1
266	514310	. . Grip Knob	1
267	514464	. . Rod and Shoe Assembly	1

Ref. No.	Part No.	Item Description	Qty
–	**514374**	**Miter Gauge Assembly** (Incl. 268-284)	
268	504268	. Lock Knob	1
269	120392	. Washer	2
270	514566	. Glide	2
271	507367	. Protractor	1
272	501407	. Headless Stop Screw	3
273	436691	. Pan Head Machine Screw	1
274	501616	. Washer	1
275	501409	. Vernier Plate	1
276	514424	. Indicator Mount & Plunger Assy (Incl. 276A)	1
276A	514307*	. . Miter Stop Plunger	1
277	504267	. Special Washer	2
278	504266	. Miter Stud	1
279	501401	. Taper Screw	1
280	518104	. Miter Gauge Bar	1
281	501635	. Machine Screw	2
282	501639	. Nylock Machine Screw	1
283	514376	. Washer	1
284	514377	. Screw	1

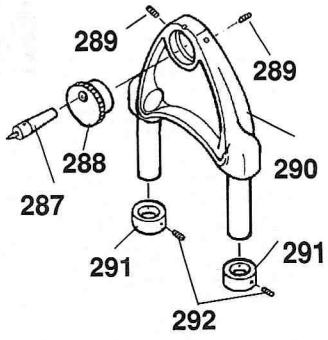
* Not available as a service part.

MISCELLANEOUS ACCESSORIES

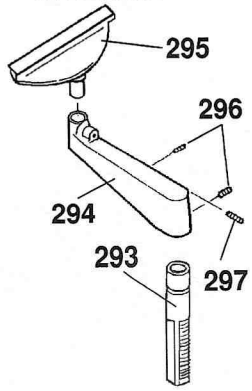
Ref. No.	Part No.	Description	Qty.
285	**505715**	**Drive Center (Incl. 286)**	1
286	222458	. Setscrew, 1/4" long	1
287	**505716**	**Cup Center**	1
—	**504276**	**Tailstock Asm. (Incl. 288-292)**	
288	5014379	. Eccentric Mount	1
289	102581	. Setscrew, 3/8" long	2
290	501438	. Tailstock & Tube Asm. (504277)	1
291	501439	. Tube Collar	2
292	222458	. Setscrew, 1/4" long	2
—	**514398**	**Tool Rest Asm. (Incl. 293-297)**	
293	514416	. Post	1
294	514264	. Arm	1
295	503749	. Tool Rest	1
296	102582	. Setscrew, 1/2" long	2
297	102585	. Setscrew, 7/8" long	1
—	**505633**	**Chuck & Key (Incl. 298-300)**	
298	**501420**	**. 1/2" Chuck (Incl. 299)**	1
299	222460	. . Setscrew, 3/8" long	1
300	**501419**	**. Chuck Key**	1
—	**514468**	**Hub and Coupling Assembly (Incl. 301-302)**	
301	503570	. Spindle Hub (Incl. 304)	1
302	503574	. Power Coupling Assembly	1
303	503738	. Idler Hub (Incl. 304)	1
304	222458	. . Setscrew, 1/4"	2
305	**513456**	**Safety Goggles**	1
306	**518221**	**Push Stick**	1
307	**518220**	**Push Block**	1
—	**518215**	**Feather Board Assembly (Incl. 308-312)**	
308	518216*	. Feather Board	1
309	513705	. Tapered Pin	2
310	513707	. Expansion Bar	1
311	513713	. Knob	2
312	513864	. Washer	2
—	**521107**	**Fence Straddler Assembly (Incl. 313-317)**	
313	521106	. Straddler Block	1
314	513706	. Slide Rail	1
315	513713	. Knob	1
316	521418	. Machine Screw	1
317	513864	. Washer	1
318	**555001**	**10" Carbide Tip Saw Blade**	1
—	**555130**	**1-1/4" Saw Arbor (Incl. 319-321)**	
319	222458	. Setscrew, 1/4" long	1
320	514400	. Arbor	1
321	514401	. Arbor Nut	1
322	**505841**	**Medium Grit Sandpaper Disc**	1
—	**555143**	**Sanding Disc Asm (Incl. 323-326)**	
323	513144*	. Plate	1
324	514493*	. Hub	1
325	222460	. Flat Point Setscrew, 3/8" lg.	1
326	513153	. Hex Socket Flat Screw	4
327	513923	. Label, Warning	1

DRIVE CENTER

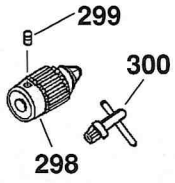
TAILSTOCK



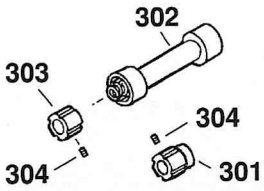
TOOL REST



DRILL CHUCK



COUPLER

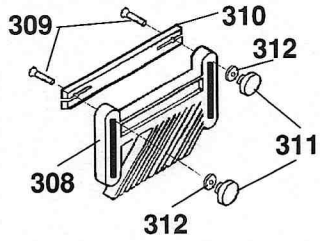


SAFETY GOGGLES

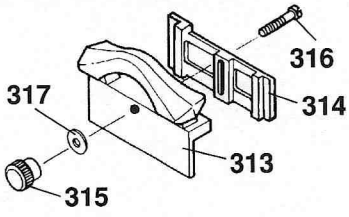
PUSH STICK

PUSH BLOCK

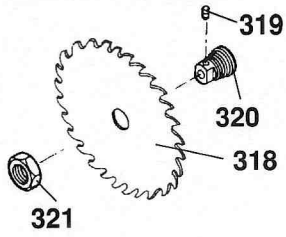
FEATHER BOARD



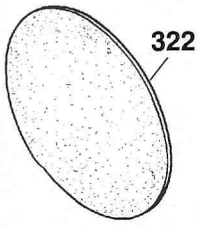
FENCE STRADDLER



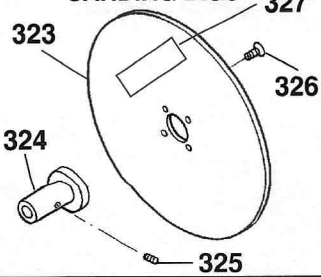
SAW BLADE & ARBOR



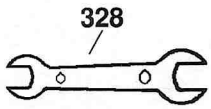
SAND PAPER



SANDING DISC



ARBOR WRENCH



Ref. No.	Part No.	Description	Qty.
328	**515979**	**Arbor Wrench**	1
—	**845332**	**Mark V Owner's Manual Asm.** includes the following:	
—	505717	. "Self-Study Guide"	1
—	845331	. "Mark V Owner's Manual"	1
—	845075	. Tabs (set)	1
—	514459	. Binder	1

NOTES

Unpacking your Mark V

Tools Needed:

- 7/16" wrench (or adjustable wrench)
- Large straightblade screwdriver
- Paste floor or paste furniture wax
- Rag
- Denatured alcohol

SAFETY

WARNING

- **Turn off and unplug the Mark V before performing any Assembly and Alignment procedure.**

- **If your Mark V has the 240 Volt motor, refer to "Mark V 240 Volt Motor" in the SAFETY section for important electrical information.**

UNPACK THE MARK V

Note

ÇRefer to the Parts Lists and Exploded Views to identify parts.

ÇSave the shipping carton in case you have to return the Mark V.

1. Make sure you clear a flat, well-lighted area, and place the Mark V Base Unit box flat on the floor.

2. Remove the band strapping from around the box. Lift off the top of the box and set it aside.

3. Move the large and small accessories box aside. Also, remove the blocking box.

4. From the large accessory box, remove the legs with hardware attached.

INSTALL THE LEGS

5. Double check to see that the headstock is locked, the extension table mount is locked, the worktable height lock is secure, and the carriage is locked.

6. Place a piece of cardboard, rug, heavy paper, or the outer carton the width and length of the Mark V on the floor directly behind the Mark.

7. With a helper on one end of the Mark V and you on the other, turn over the Mark V onto the cardboard. See Figure B-23. The extension table and the worktable will support the machine. Take care not to scratch the table tops.

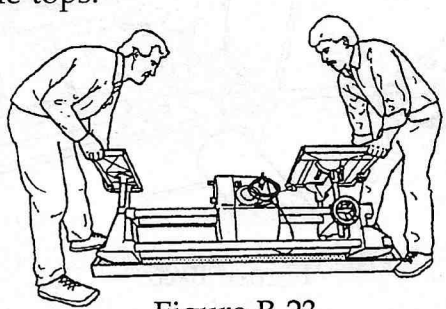


Figure B-23

8. Place the "lip" of a leg (30) inside the Mark V base, as shown in Figure B-24.

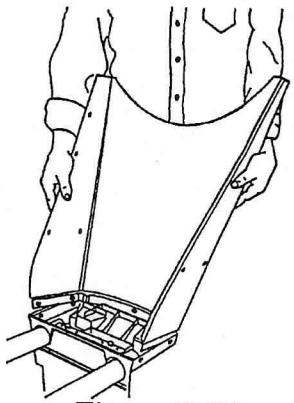


Figure B-24

9. Insert a screw (31) through a hole in the base and leg. Use a star washer (32) and nut (33) to attach the screw, as seen in Figure B-25. Finger tighten.

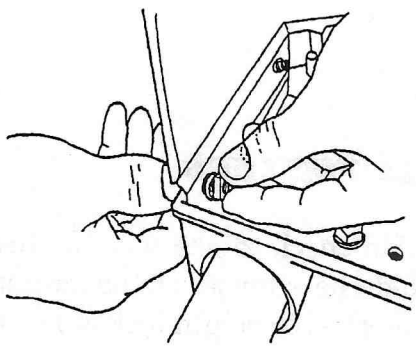


Figure B- 25

10. Do the same for the remaining four holes in the leg. After all five screws are attached, use a medium screwdriver and a 7/16" wrench to tighten only enough to allow movement with firm pressure. See Figure B-26.

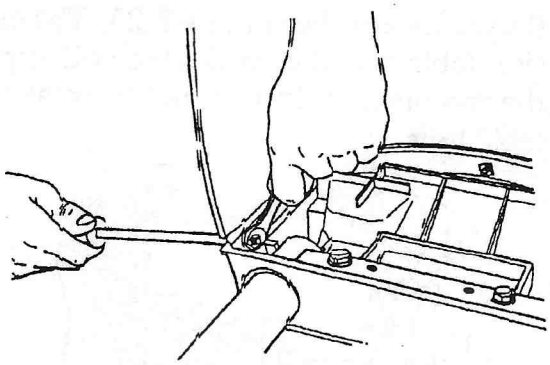


Figure B-26

11. Follow Steps 8 through 10 for installing the other leg.

NOTE

Recheck the legs periodically, because moving the Mark V around the workshop could possibly cause the leg nuts (33) to loosen and become misaligned.

Also, if you have purchased the optional retractable casters, install them now.

12. With a helper, turn the Mark V right side up, as seen in Figure B-28. Figure B-29 shows the Mark V upright.

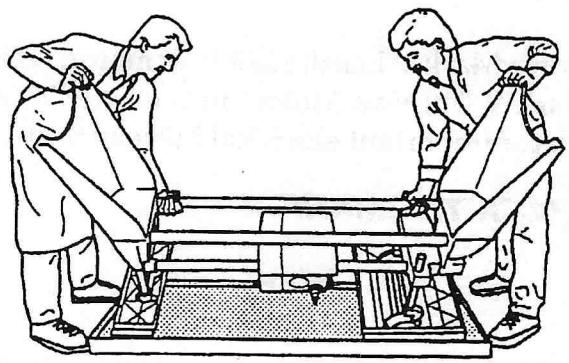


Figure B-28

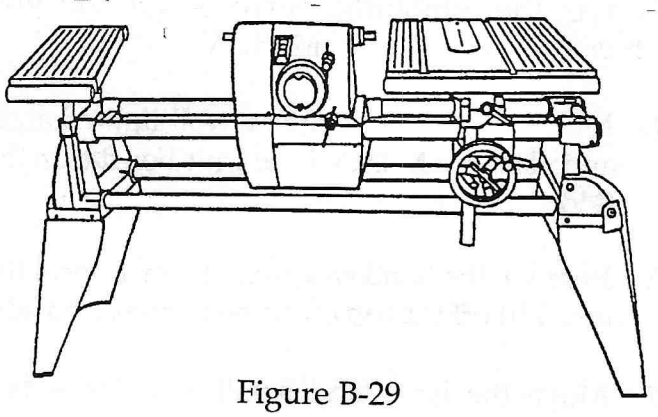


Figure B-29

13. With the machine setting upright securely tighten all ten screws and nuts that hold the legs to the headrest and bench.

CLEAN AND WAX

CAUTION

Use paste floor or paste furniture wax. They protect and lubricate. Do not use car wax or spray furniture wax.

14. Use a rag and denatured alcohol to clean the Mark V, tables, tubes and accessories. If you find any burrs, remove them with a fine file.

15. Use a clean, dry rag and furniture paste wax to wax and buff:

- the worktable (shown in Figure B-31) and extension table surfaces
- way tubes
- rip fence
- miter gauge bar
- quill
- mounting holes in the power and base mounts

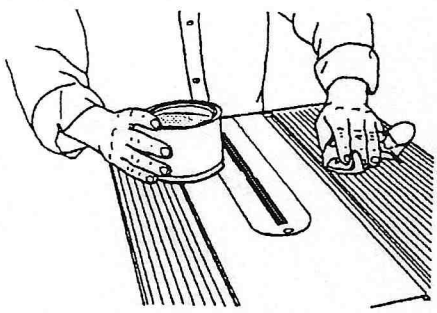


Figure B-31

a. Do not wax the trunnions (148, 149) on the worktable. When you wax and buff the quill (59) do not leave any wax in the racks. If you do, the wax will mix with sawdust and impede the movement of parts.

16. After you apply wax to the mounting holes in the head rest (left) and base arm (right), wrap a rag around a scrap of wood and buff out the wax thoroughly. See Figure B-33.

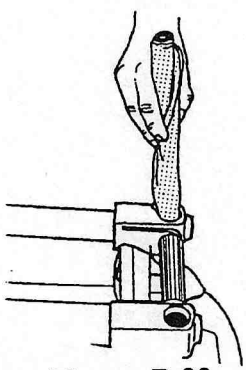


Figure B-33

NOTE

YOUR NEW MARK V HAS BEEN ASSEMBLED AND ALIGNED AT OUR FACTORY. YOU SHOULD NOT NEED TO PERFORM ANY ALIGNMENT PROCEDURES ON YOUR NEW MACHINE, UNLESS YOU EXPERIENCE DIFFICULTY WITH THE BLADE OR BIT BURNING THE WOOD, INACCURATE CUTS, OR KICK-BACK.

NOTES

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Alignment of Model 520

Tools Needed:

- 3/16" Allen wrench
- 5/32" Allen wrench, long handle (provided)
- 5/32" Allen wrench, short handle (provided)
- 5/16" Allen wrench (provided)
- 9/16" wrench
- Arbor wrench (provided)
- 1/2" wrench
- Adjustable wrench (optional)
- 1/2" socket and ratchet wrench with short extension
- 3/8" to 1/2" drill bit
- Small Straightblade screwdriver
- Medium Straightblade screwdriver
- Medium Phillips screwdriver
- High quality combination square

SAFETY

WARNING

Make sure the speed dial is set to "Slow", then turn off and unplug the Mark V before performing any ALIGNMENT procedure.

1. Complete **ALL** of the following procedures– and then recheck them at regular intervals. You **MUST** use an accurate combination square for alignment and adjustment. To check that your square is accurate, select a board with at least one straight and true edge. Place the square against the good edge and draw a line across the width. Flop the square over and hold it against the same edge and draw another line next to the first one. If the lines are parallel, your square is accurate.

2. All the parts and accessories which support or guide the stock **MUST** be aligned **parallel with** or **perpendicular to** the main spindle's plane of rotation. During the following alignment procedures the saw blade (provided in the accessories box) will represent the main spindle's plane of rotation.

NOTE

If you have installed casters (optional) on your Mark V, make sure they are retracted and the legs on the Mark V sit firmly on a level floor. Do this now.

Also, remember that your Mark V could possibly go out of alignment if it is moved to an area with varying floor levelness. Remember to recheck alignment and make needed adjustments after moving your Mark V, if needed.

ADJUST THE HEADREST LOCK

1. To check the headrest lock (15), grasp the way tubes near the tie bar (25) and pull up, as demonstrated by the right hand in Figure B-44.

2. If there is "give" in the lock, unlock the handle and use a medium Phillips screwdriver to turn the lock shaft (6) **clockwise,** as done by the left hand in Figure B-44. If the lock is difficult to operate, the shaft is too tight. To loosen, unlock the handle and turn the shaft **counterclockwise.**

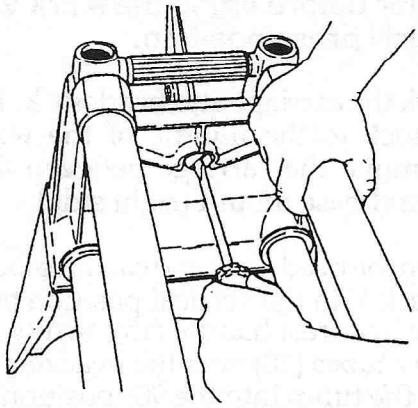


Figure B-44

ADJUST THE CARRIAGE LOCK

3. **If the carriage lock handle (187) does not lock into the horizontal position or the carriage moves out of position, the lock needs adjusting. To adjust the lock, use a 1/2" socket with an extension and ratchet handle to tighten or loosen the nut located at the back of the carriage assembly, as shown in Figure B-45.**

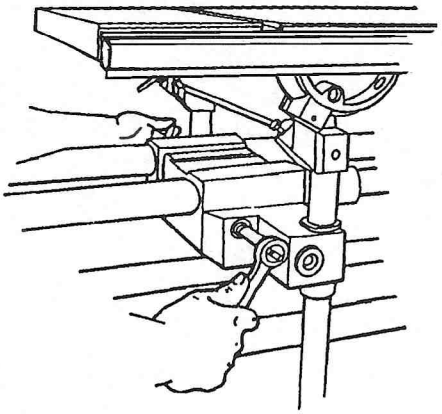


Figure B-45

4. When the carriage lock handle locks into the horizontal position and the carriage no longer moves when the handle is in the horizontal position, tighten the nut a final 1/4 turn.

WARNING

The carriage lock handle MUST lock into the horizontal position, otherwise the carriage lock may vibrate loose.

SET THE WORKTABLE'S 90° LEFT STOP

WARNING

Always make sure the Mark V headstock and carriage are locked and all casters are raised off the floor before lifting the Mark V into the vertical drill press position.

5. Unlock the carriage and headstock. Move the headstock to the middle of the way tubes. Then move the carriage between the headstock and base mount (right side).

6. Tighten the headstock and carriage locks. Place the Mark V in the vertical position by loosening the headrest handle (15), firmly grasping the way tubes (20) near the headrest end, and lifting the tubes into the 90° position, as demonstrated in Figure B-46.

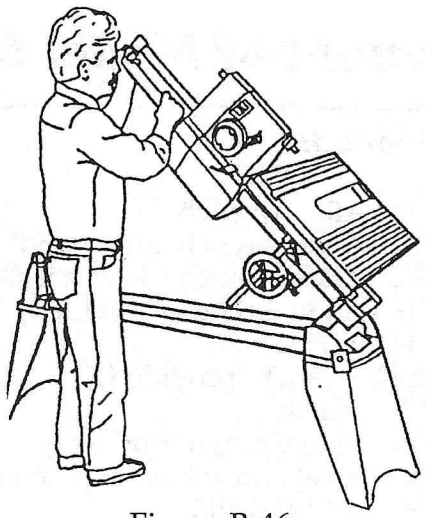


Figure B-46

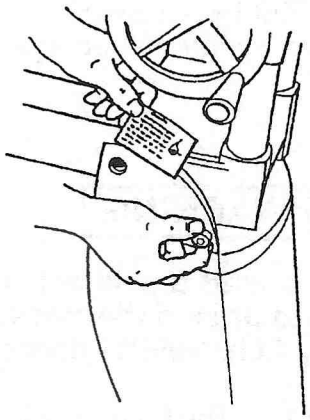


Figure B-47

7. See Figure B-47. Use your fingers to screw in the base lock (2). Note the base lock is slightly off center to the countersink found in the bench base, as shown in Figure B-48. This offset allows the base lock to more firmly hold the base in place.

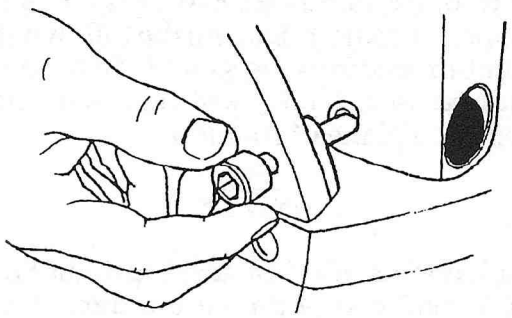


Figure B-48

8. Move the worktable into the 90° position by loosening the table tilt lock (165), as seen in Figure B-49, then putting the worktable in the horizontal 90° position, as shown in Figure B-50. Retighten the table tilt lock only enough to allow movement with firm pressure.

9. Use a 5/32" Allen wrench to remove the table insert, as demonstrated in Figure B-51.

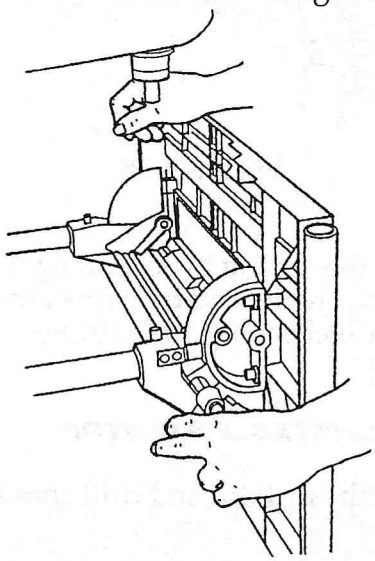


Figure B-49

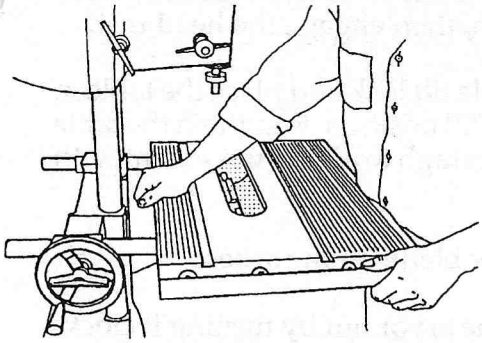


Figure B-50

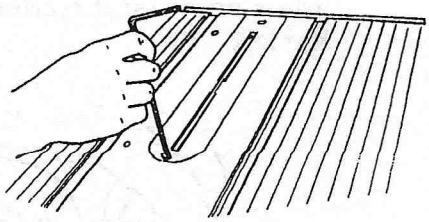


Figure B-51

10. To install the drill chuck, mount the chuck on the spindle and align the chuck's set screw with the spindle knob's set screw, as shown in Figure B-52. This allows the chuck's set screw to set on the flat part of the spindle. Use a 5/32" Allen wrench to securely tighten the drill chuck's set screw.

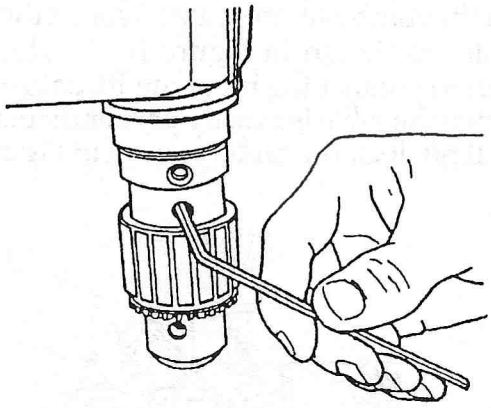


Figure B-52

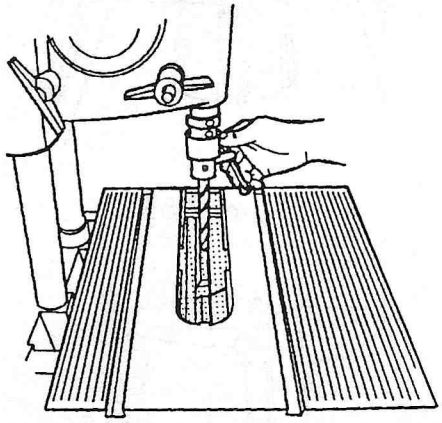


Figure B-53

11. Install a 3/8" to 1/2" straight drill bit in the drill chuck and use the chuck key to lock it place. See Figure B-53.

NOTE

Check the straightness of the drill bit by rolling it on a flat surface. You can also hand-rotate the drill chuck while holding the combination square against the drill bit and the table. If the bit is not straight DO NOT use it for these alignment instructions.

12. With the drill bit above the table opening, use the quill feed to extend the bit 1/2" into the table opening, as in Figure B-54.

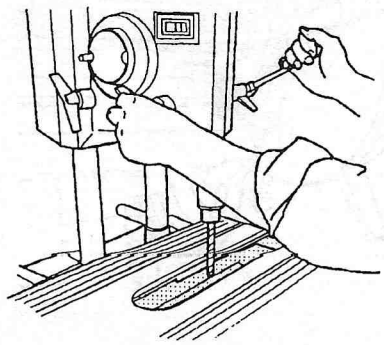


Figure B-54

13. Set the combination square against the bit and table, as shown in Figure B-55. The square should contact the bit along its entire length. When the table is exactly perpendicular to the drill bit, lock the table, as seen in Figure B-56.

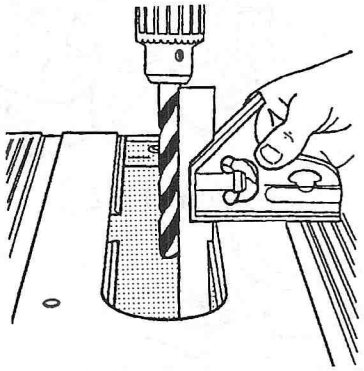


Figure B-55

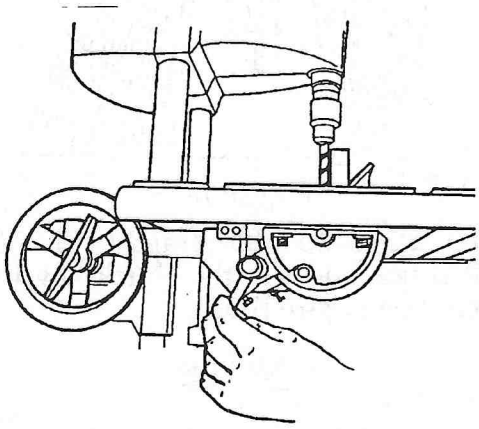


Figure B-56

14. **Both** 90° stops (shown in Figs. B-57 and B-58) should contact the underside of the table. If they don't, use a 1/2" wrench to adjust the stops.

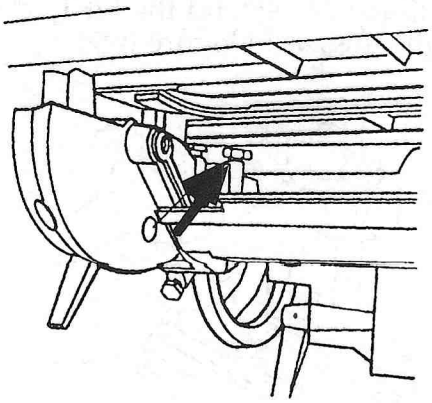


Figure B-57

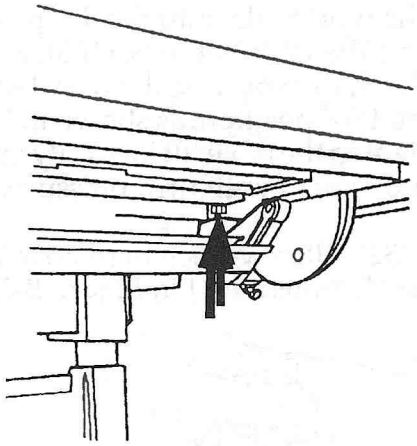


Figure B-58

15. Recheck the setting by loosening the tilt lock, moving the table, and then repeating Steps 13 and 14. (Rechecking the settings is very important!)

SET THE WORKTABLE'S 0° STOP

16. Remove the drill bit and drill chuck from the spindle.

17. Loosen the base lock (2). Firmly grasp the way tubes and lower the headstock into the horizontal position, then engage the head rest.

18. Loosen the table tilt lock and place the table in the horizontal "0" position. Retighten the table tilt lock only enough to allow movement with firm pressure.

19. Mount the saw blade on the arbor:

    a. Remove the arbor nut by turning it clockwise, as seen in Figure B-59a. Hold the arbor with the threaded part pointing to the left.

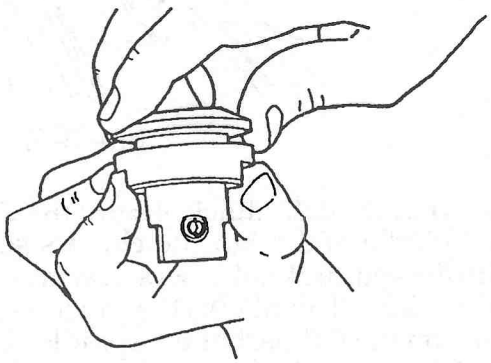


Figure B-59a

b. Hold the blade with the teeth pointing toward you, as shown in Figure B-59b, then insert the arbor through the hole. Replace the nut and finger tighten it, as in Figure B-59c.

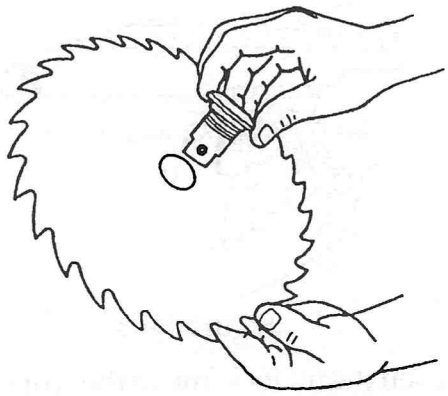


Figure B-59b

Figure B-59c

c. Place the blade and arbor on your workbench with the nut pointing up.

d. Hold the arbor with an adjustable wrench and tighten the arbor nut with the arbor wrench, as demonstrated in Figure B-59d. Another way to tighten the arbor nut is to clamp the arbor in a bench vise, as illustrated in Figure B-59e, and tighten the nut with the arbor wrench.

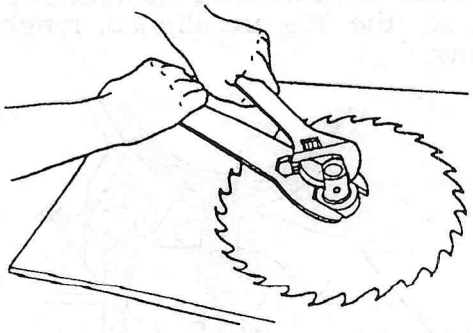


Figure B-59d

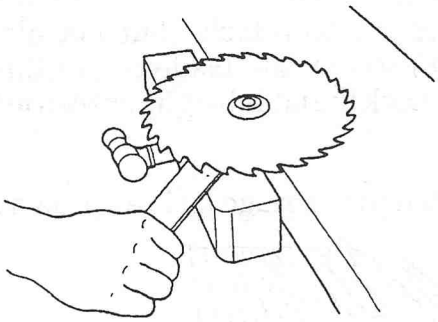


Figure B-59e

NOTE

The only time the saw blade is used without the upper or lower saw guards is during alignment and only after the Mark V is turned off and unplugged.

20. Mount the saw blade on the spindle and align the arbor set screw with the spindle knob's set screw, then use a 5/32" Allen wrench to tighten the arbor set screw, as seen in Figure B-60.

21. Reinstall the table insert (138) in the worktable.

22. Raise the worktable so that it clears the top of the saw blade.

23. Loosen the carriage lock and slide the carriage so the saw blade is directly beneath the slot in the table insert. See Figure B-61.

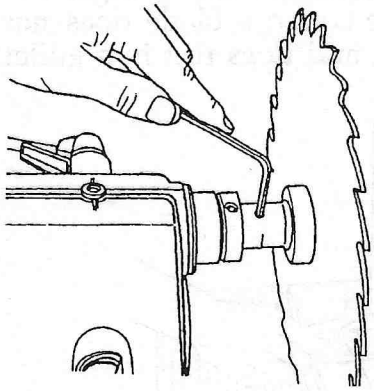


Figure B-60

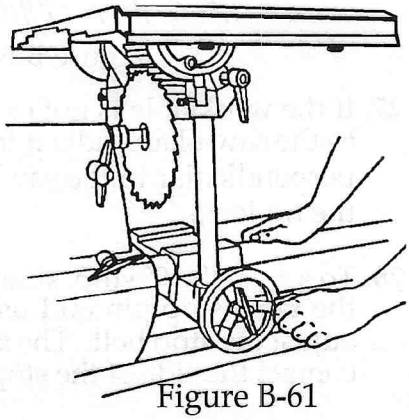


Figure B-61

24. Lower the worktable (but not all the way down) so the saw blade comes through the slot. Lock the table height, as seen in Figure B-62.

25. Tighten the carriage lock, as shown in Figure B-63.

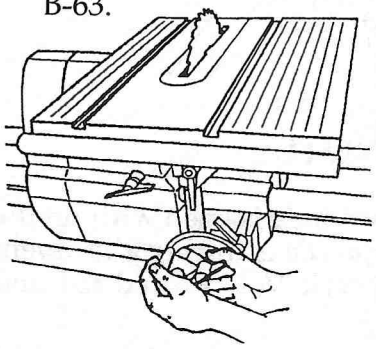


Figure B-62

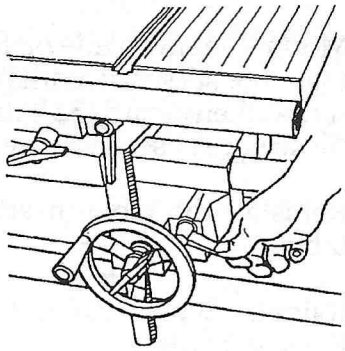


Figure B-63

26. Place the combination square against both the saw blade and worktable, as seen in Figure B-64. Make sure the square's blade does **not** touch a saw tooth and **does** rest in a gullet between teeth.

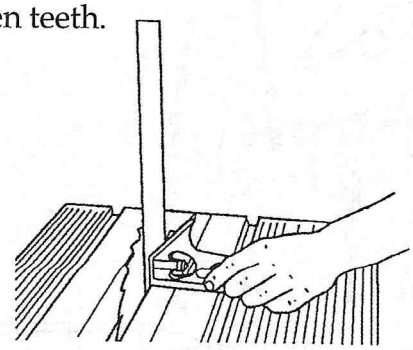


Figure B-64

27. If the worktable is not exactly perpendicular to the saw blade, adjust the worktable so it is perpendicular to the saw blade, then tighten the tilt lock.

28. To adjust the 0° stop, simultaneously depress the table stop pin and use a 1/2" wrench to adjust the stop bolt. The stop bolt should just contact the side of the stop pin. Once the stop bolt is adjusted, the stop pin will "lock" back when the tilt lock is tightened. See Figure B-65.

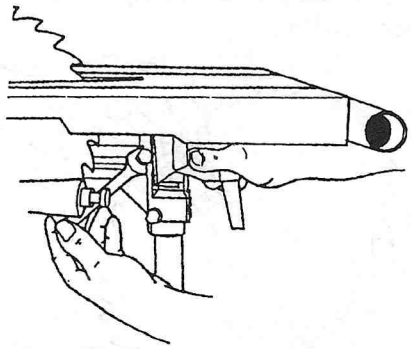


Figure B-65

29. Loosen the tilt lock, move the worktable, then depress the 0° stop pin until the stop bolt contacts it. Tighten the tilt lock, and recheck the setting by repeating Steps 26 through 28. See Figure B-66. (It is very important to re-check the setting!)

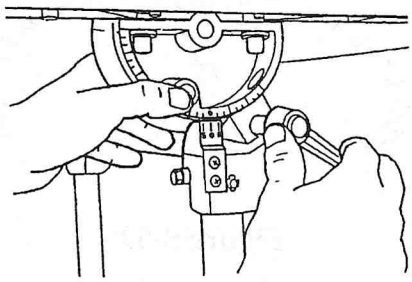


Figure B-66

ADJUST THE TABLE TILT INDICATOR

30. Tighten the table tilt lock and check that the "0" mark on the indicator aligns with the "0" mark on the trunnion ((149).

31. To adjust the scale, use a medium Phillips screwdriver to loosen the two screws which hold the indicator to the tie bar. See Figure B-67. Then while holding the indicator in position so the "0"s are aligned, retighten the screws.

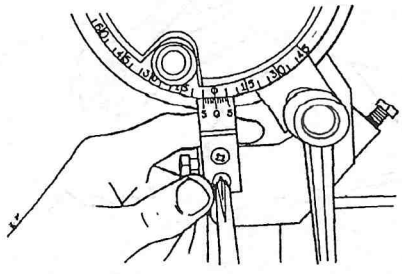


Figure B-67

ADJUST THE WORKTABLE'S 45° STOPS

32. Loosen the table height lock and raise the table until it clears the saw blade. Tighten the height lock.

33. Loosen the tilt lock and tilt the worktable to the right until it makes contact with the two 45° stop bolts (158).

34. Tighten the tilt lock only enough to allow movement with firm pressure.

35. Loosen the quill feed (shown in Figure B-68) and extend the quill so the saw blade is centered beneath the slot in the table insert. When it is centered, lock the quill feed.

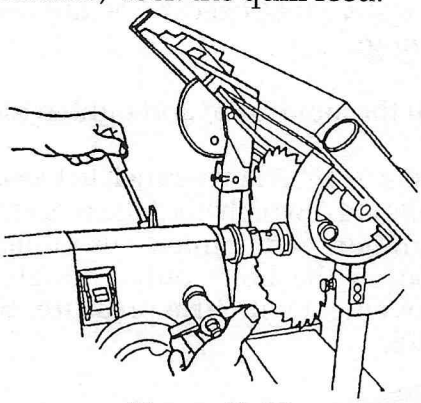


Figure B-68

36. Lower the worktable so the saw blade extends through the slot. See Figure B-69. Lock the table height.

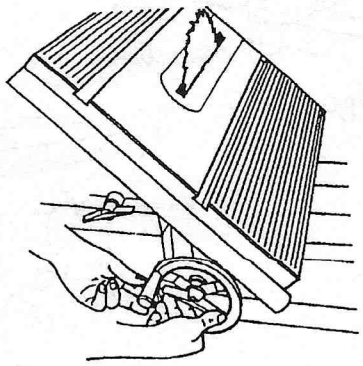


Figure B-69

37. Remove the blade from the combination square and place the square against the saw blade and the worktable, as shown in Figure B-70. Make sure the combination square doesn't rest on the table insert.

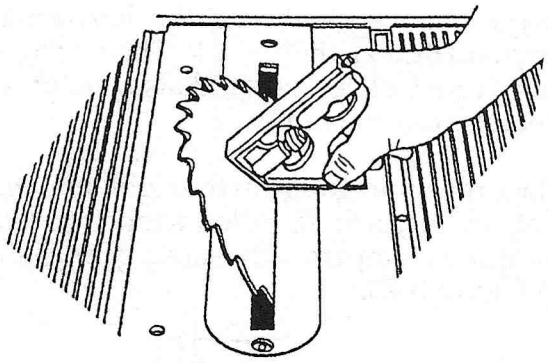


Figure B-70

38. If the worktable is not exactly 45° to the saw blade, adjust the worktable so it is.

39. Tighten the tilt lock, then use a 1/2" wrench to adjust the 45° stop on the front side of the worktable (shown in Figure B-71) and the back side of the worktable (shown in Figure B-72). The stops should just contact the underside of the table.

40. Loosen the tilt lock and move the table. To recheck the 45° stops, repeat Steps 35 through 39. (It is very important to recheck the setting!)

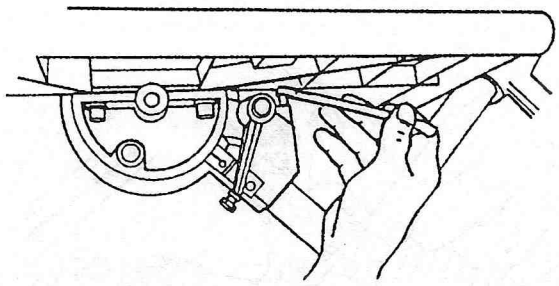


Figure B-71

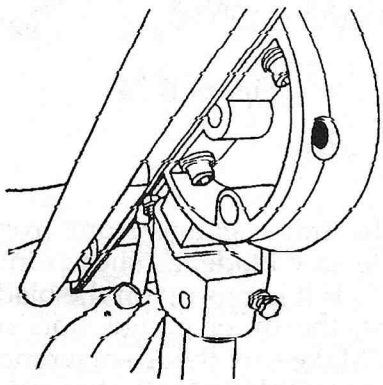


Figure B-72

ALIGN THE MITER GAUGE SLOTS

41. Return the worktable to the horizontal "0" stop and tighten the tilt lock. The carriage lock and headstock lock should also be tightened. Remove the table insert.

42. Place the miter gauge in the right miter gauge slot, and use a 5/32" Allen wrench to remove the quick clamp from the safety grip, as shown in Figure B-73.

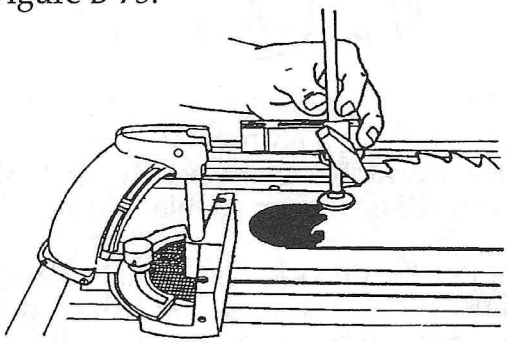


Figure B-73

43. Insert the long 5/32" Allen wrench through the miter gauge. Borrow a set screw from the lathe tool rest and use the short 5/32" Allen wrench to install it in either top miter gauge hole, as seen in Figure B-74. Place the tip of the long wrench against the front side of the saw blade and tighten the set screw.

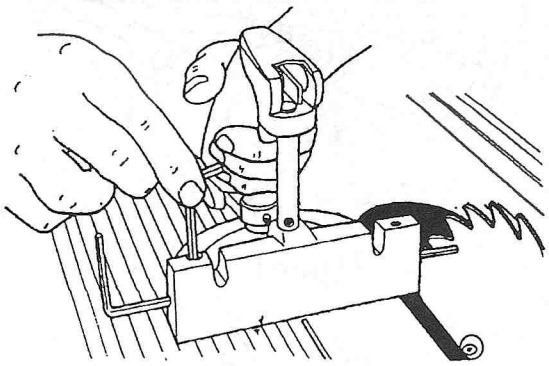


Figure B-74

44. Move the miter gauge from front to back along the saw blade, as shown in Figs. B-75 and B-76. If it hangs up on the blade or a gap develops, the miter gauge slots need to be aligned. Make sure the Allen wrench does not contact a saw blade tooth, because the tooth "set" will cause misalignment.

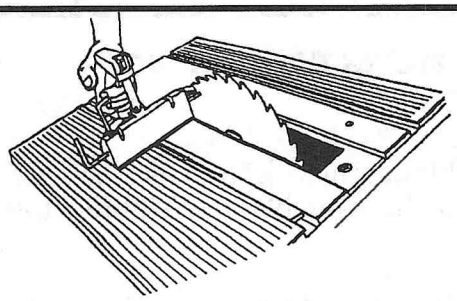


Figure B-75

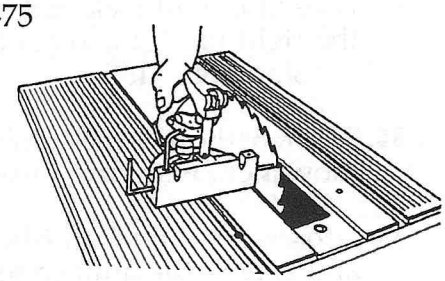


Figure B-76

45. If the miter slots need to be aligned, do the following:

a. Tilt the table to 45° and tighten the tilt lock.

b. Use a 5/16" Allen wrench to loosen all four bolts (147) which hold the worktable to the trunnions, as pointed out in Figure B-77. Loosen the bolts only enough to allow movement with firm pressure. See Figure B-78.

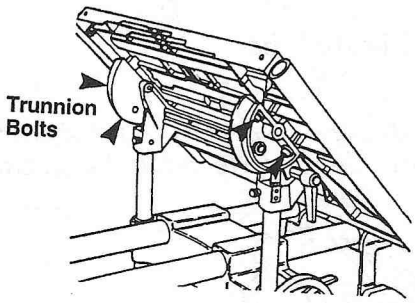


Figure B-77

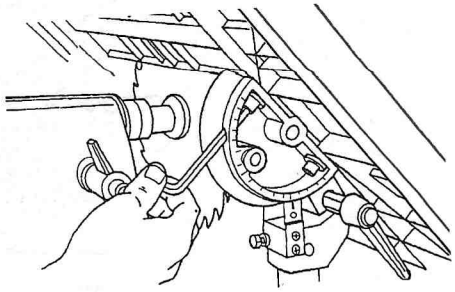


Figure B-78

NOTE

If you find it difficult to loosen the bolts, consider using a T-handle Allen wrench, or use a boxed wrench for extra torque. Another alternative is to use the hanging hole in an adjustable wrench, as demonstrated in Figure B-78a.

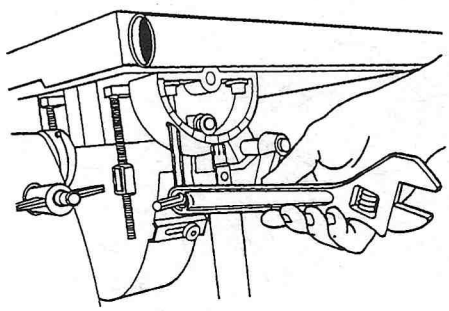


Figure B-78a

c. Position the worktable back to the horizontal "0" and tighten the tilt lock.

d. Adjust the worktable, then again move the miter gauge and wrench along the face of the saw blade until the wrench tip consistently contacts the entire blade surface.

e. When the miter gauge slot is aligned, use the 5/16" Allen wrench to retighten the two trunnion bolts which are closer to the headstock. Then loosen the table tilt lock, tilt the worktable to 45°, **and retighten the table tilt lock.** Use the 5/16" Allen wrench to retighten the other two trunnion bolts.

f. Loosen the table tilt lock and move the table, then return it to the horizontal "0" position. Recheck the slot alignment. If it is off, repeat Steps **d** and **e**.

NOTE

Tighten the bolts only after the table tilt lock is secured. Otherwise the worktable will bow or bind the next time the table tilt lock is tightened.

INSTALL THE TABLE INSERT IN THE WORKTABLE

46. Place the table insert in the worktable recess. Use a 5/32" Allen wrench to start both screws.

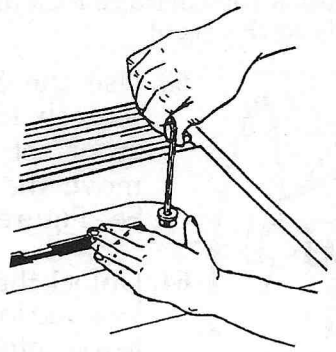


Figure B-79

47. First tighten the rear screw. Then the front of the insert will be sprung slightly above the table. Level the insert by placing your hand on the front of the insert, as in Figure B-79, and slowly turning the front screw until it draws the front of the insert flush with the worktable surface.

ADJUST THE MITER GAUGE GLIDES

48. Place the miter gauge in the worktable's miter gauge slot. See Figure B-80.

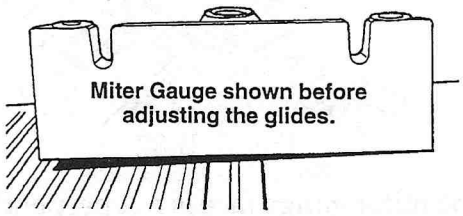


Figure B-80

49. Check to see if the miter gauge wobbles side-to-side. Also, slide it back and forth in the slot to check if the miter gauge scrapes against the table. If the miter gauge rocks or scrapes the table, adjust the glides.

50. If the glides need to be adjusted, do the following:

a. Remove the miter gauge from the slot and turn it over.

b. Use a medium screwdriver to screw the glides in or out, as illustrated in Figure B-81, so that the glides hold the miter gauge 1/64" to 1/32" off the worktable and the miter gauge does not rock in the slots.

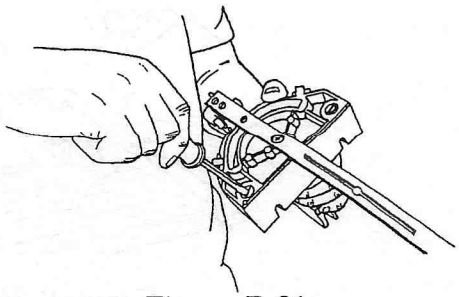


Figure B-81

c. Return the miter gauge to the slot and recheck and re-adjust it, if needed.

ADJUST THE MITER GAUGE FACE

51. Remove the safety grip from the miter gauge. Make sure you keep the small, thin washer.

52. Put the miter gauge in the right slot and place the combination square against the saw blade and miter gauge face, as seen in Figure B-82.

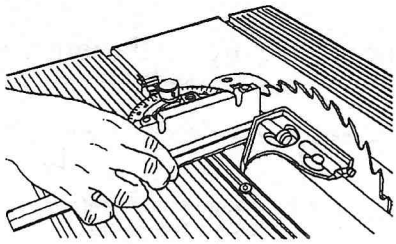


Figure B-82

53. If the miter gauge face is not perpendicular to the saw blade, do the following:

    a. Use a long Allen wrench to loosen the lock knob (268) and adjust the miter gauge so it is perpendicular to the saw blade, then tighten the lock knob. See Figure B-83.

    b. Use a medium screwdriver, loosen the screw (273) which holds the indicator plate (275), and set its "0" to the miter gauge's "90". Tighten the screw. See Figure B-84.

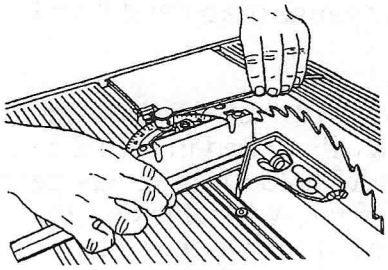


Figure B-83

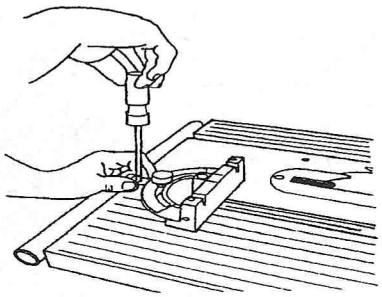


Figure B-84

ADJUST THE 90° POSITIVE STOP

54 Use a small screwdriver to back out the 90° stop screw 2 to 3 turns, as shown in Figure B-85.

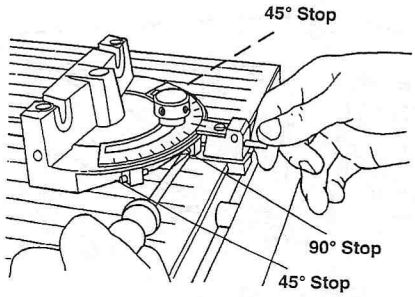


Figure B-85

55. Depress the plunger, then turn the stop screw until you feel it touch the plunger.

56. To re-check the stop setting, repeat Steps 52 through 55.

ADJUST BOTH 45° STOPS

57. Loosen the lock knob (268) and pull out the plunger. Then, at the same time, rotate the miter gauge and push in the plunger until it hits the 45° stop (there is one on each side of the 90° stop).

58. Use a combination square to set the miter gauge face at 45° to the saw blade. If the 45° stop needs adjustment, use a medium screwdriver to back out the 45° screw 2 to 3 turns.

59. Depress the plunger, then turn the stop screw until you feel it touch the plunger.

60. To recheck the stop setting, repeat Steps 54 through 59.

61. To adjust the other 45° stop, repeat Steps 57 through 60.

REMOVE THE SAW BLADE

62. Loosen the table height lock and raise the table so that it clears the saw blade, then tighten the lock. Unlock the carriage lock and move the worktable to the right.

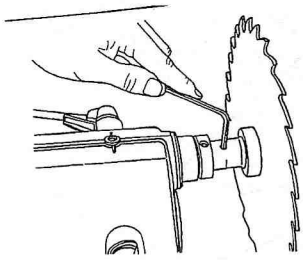


Figure B-86

63. Use the 5/32" Allen wrench to loosen the arbor set screw. Remove the saw blade. See Figure B-86.

64. Unlock the table height lock and lower the table to a comfortable working height. Tighten the lock.

ALIGN THE PRO FENCE PARALLEL WITH THE WORKTABLE

63. Place the miter gauge in the left slot of the worktable on the infeed side. Place the Pro Fence on the right side of the saw table.

64. Insert the long 5/32" Allen wrench through the miter gauge and secure it using the short 5/32" Allen wrench and a set screw borrowed from the tool rest.

65. Move the fence toward the Allen wrench until it just touches it.

66. Lock the lower fence lock handle first, then lock the upper fence lock handle to secure both ends of the pro fence.

67. Slide the miter gauge back and forth in the slot. The tip of the Allen wrench should keep in slight contact with the fence. Watch that you don't scratch the fence.

68. If the allen wrench pulls away from or binds against the fence, the fence needs aligning. If so, do the following:

    a. Using the short 5/32" short Allen wrench, loosen the four button head cap screws (3), located on the top of the fence, slightly. They should be just tight enough to require firm pressure to align the fence.

    b. Raise the upper fence lock handle only to unlock the rear of the fence.

    c. Adjust the rear end of the fence so that it just touches the allen wrench as the miter guage slides along the fence.

    d. When alignment is reached, lock the upper fence lock handle. Slide the miter gauge back and forth to double check your alignment. Using the short 5/32" Allen wrench, tighten the four button head cap screws (3) completely.

ALIGN THE EXTENSION TABLE

NOTE

These instructions are for aligning the extension table on the right side of the headstock. You can also follow these same procedures to align it to the left side of the headstock.

For most projects, align the extension table on the right side, since it can usually be used when placed on the left side. However, once the extension table is aligned on the right side, it cannot be transferred to the left side and still maintain precise alignment.

If you wish precise alignment on the left side, repeat the following instructions– but place the extension table on the left side in the headstock.

69. Mount the extension table in the Mark V's accessory base mount (on the right side) at a comfortable height, as shown in Figure B-99. Use a 1/2" wrench to loosen the bottom nuts holding the table base to the table approximately 1/4" from the table. This will allow you room for later adjustment.

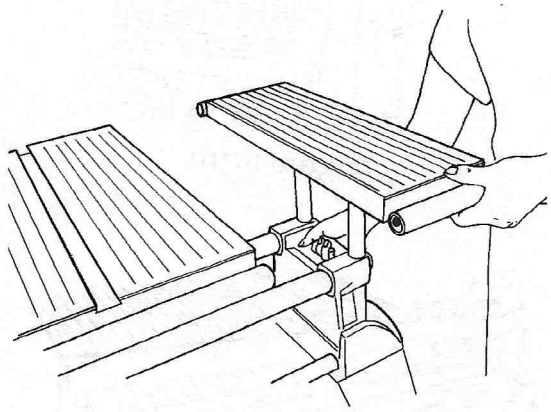


Figure B-99

70. The worktable should already be mounted in the carriage mount. Move the worktable next to the extension table and adjust it to about 1/4" above the extension table, as seen in Figure B-100.

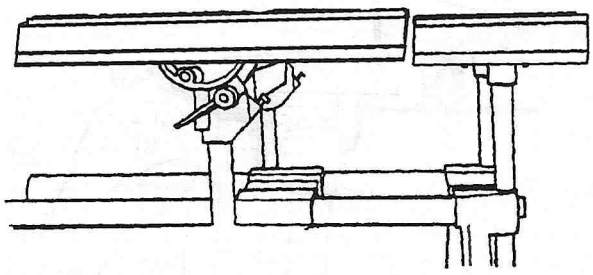


Figure B-100

71. Hold a straightedge against the **infeed edge** of both the worktable and extension table tubes, as in Figure B-101. Line up the extension table's infeed edge with the worktable's infeed edge. The elongated holes in the extension table's base permit you to slide the extension table forward and backward.

72. Hold a straightedge on the **infeed top surface** of both the worktable and the extension table, as shown in Figure B-102. As needed, adjust the top nuts located on the infeed side of the extension table, in order for the straightedge to be level across both the worktable and the extension table infeed sides. See Figure B-102a.

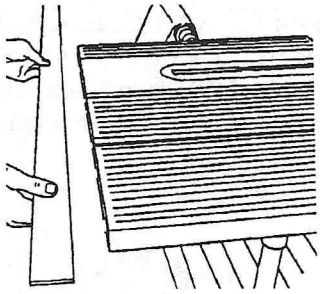


Figure B-101

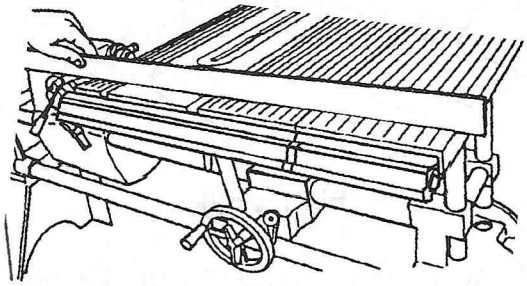


Figure B-102

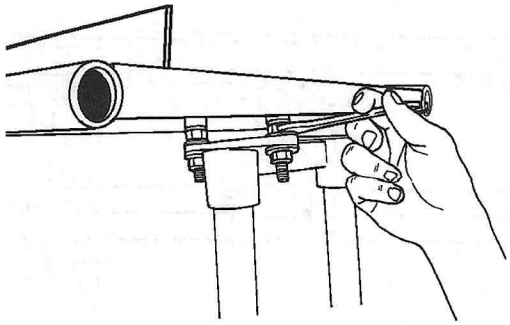


Figure B-102a

73. Hold the straightedge on the **outfeed top surface** of both the worktable and the extension table, as seen in Figure B-103. As needed, adjust the top nuts located on the outfeed side of the extension table, in order for the straightedge to be level across both the worktable and the extension table outfeed sides.

74. Double check the levelness at the infeed and outfeed sides of the table surfaces. All four top nuts (those nearest the table) used in leveling the extension table should be touching the base.

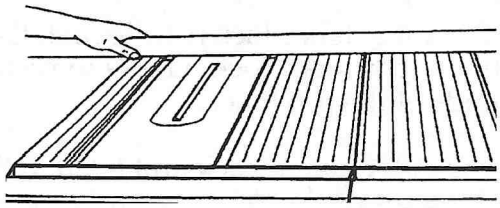


Figure B-103

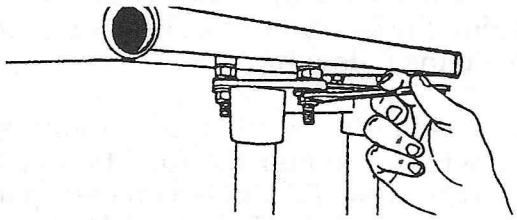


Figure 103a.

75. When the tables are aligned on three sides– **infeed side edge** (along the table tubes, as in Figure B-101), **infeed top surface** (as in Figure B-102), and **outfeed top surface** (as in Figure B-103) – securely tighten the bottom nut on each of the four studs, as seen in Figure 103a.

CAUTION

DO NOT overtighten the nuts. Tighten the nuts until they bottom out, then no more than 1/8 additional turn. Overtightening the nuts will stretch and damage the threads.

NOTE

If you move the Mark V to another location– especially one with an uneven floor– remember to re-check the extension table alignment.

ALIGN THE EXTENSION TABLE TUBES

76. Place the straightedge along the infeed-side tops of both the worktable and extension table tubes, as shown in Figure B-104.

77. If the extension table's tube is not aligned with the worktable's tube, use a 7/16" wrench to slightly loosen both keps nuts (248) attaching the tube to the extension table. Make the needed adjustments, then re-tighten the nuts. See Figure B-105.

78. Repeat Steps 85 and 86 for the extension table's tube located on the outfeed-side.

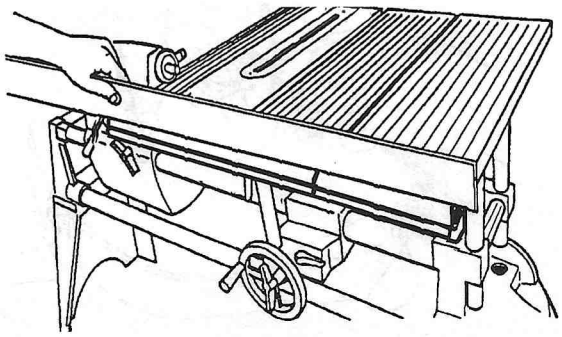


Figure B-104

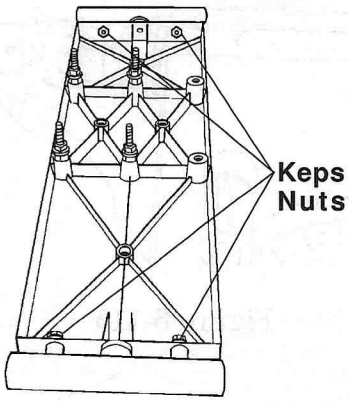


Figure B-105

MOUNT THE SAW GUARD

79. Loosen the accessory mount lock and remove the extension table. Loosen the table height lock and remove the worktable. Place the saw blade and arbor in the lower saw guard cover (204).

80. Fit the lower saw guard's clamp on the spindle quill (59). Line up the arbor set screw with the spindle knob's set screw (where the spindle flat is located). Use a 5/32" Allen wrench to tighten the arbor set screw, as shown in Figure B-106.

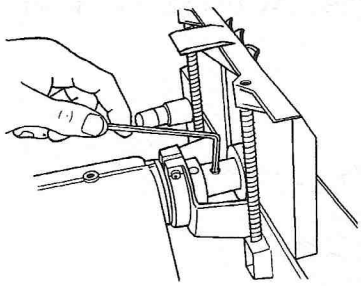


Figure B-106

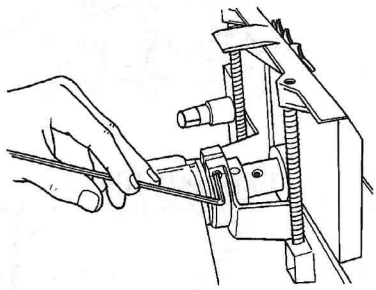


Figure B-107

87. Use the 5/32" Allen wrench to tighten the socket head screw (215) on the saw guard collar, as seen in Figure B-107.

INSTALL THE RIVING KNIFE

82. Loosen the guard lock knob (210) and insert the upper saw guard's riving knife (199) between the guard (213) and the lock plate (208), as demonstrated in Figure B-108.

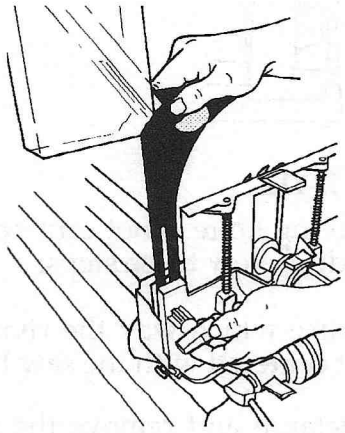


Figure B-108

83. Make sure the riving knife is fully seated between the guard and the lock plate, as in Figure B-109. The curved portion of the riving knife should be very close to the saw blade teeth (about 1/8"), as illustrated in Figure B-110. Tighten the guard lock knob (210). Look to see if the riving knife is centered with the saw blade, as shown in Figure B-111.

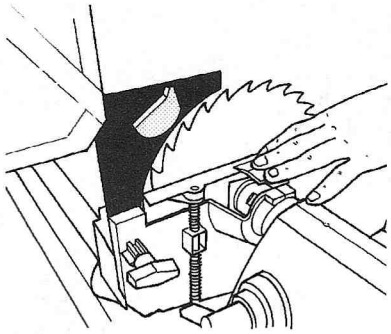


Figure B-109

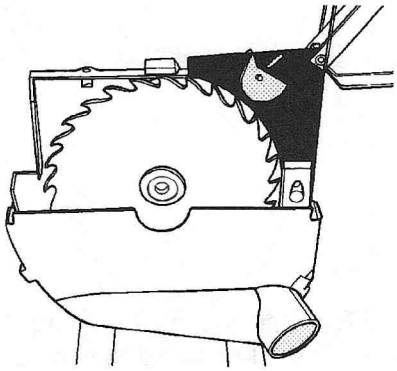


Figure B-110

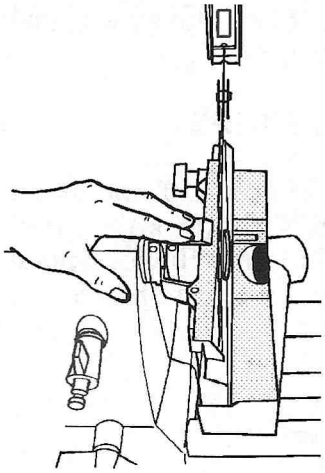


Figure B-111

84. If the riving knife is not centered with the saw blade, follow these steps:

a. Notice which way the riving knife is not centered with the saw blade.

b. Unclamp and remove the upper saw guard, then remove the saw blade and lower saw guard.

c. Use a 5/32" Allen wrench to adjust the stop screw (211) located below the lower saw guard's collar, see Figure B-112.

- If the riving knife is to the **left** of the saw blade, back out the stop screw (counter-clockwise).

- If the riving knife is to the **right** of the saw blade, screw in the stop screw (clockwise).

d. Re-install the saw blade, lower saw guard and riving knife, according to Steps 88 through 92. If the riving knife is still not centered on the saw blade, repeat this Step 93.

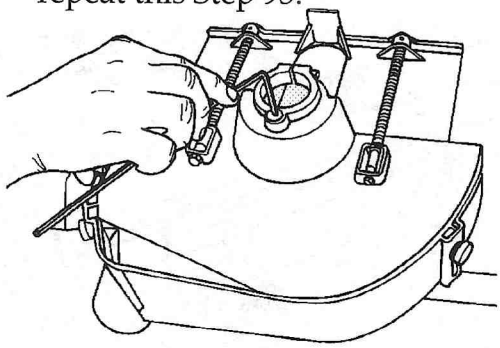


Figure B-112

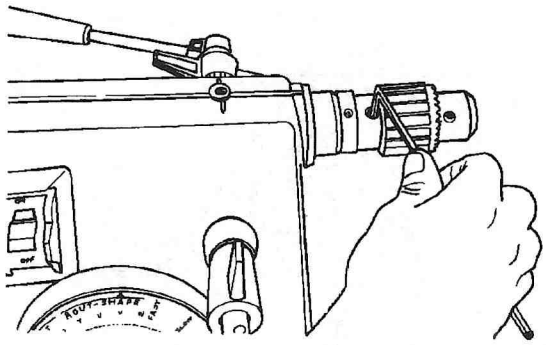


Figure B-113

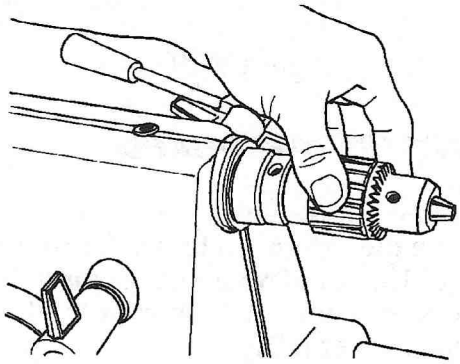


Figure B-114

ALIGN THE LATHE CENTERS

85. Remove the saw guards and the saw blade, then loosen the carriage and headstock locks. Move the headstock and carriage all the way to the right and lock them in place.

86. Mount the drill chuck on the spindle, as shown in Figure B-113. Completely close the chuck jaws, as in Figure B-114.

87. Mount the cup center into the tailstock's adjustable center, as seen in Figure B-115, then mount the tailstock into the base mount (right side). Tighten the mount lock.

88. Loosen the quill lock. Extend the quill (seen in Figure B-116), so the drill chuck almost touches the cup center point and the center point could fit into the chuck jaws.

89. If the center point does not "fit" into the chuck jaws, determine whether you need to adjust the cup center point horizontally and/or vertically. Then do the following:

    a. To adjust the cup center point **horizontally**, loosen the set screw that locks the adjustable center, as seen in Figure B-117. Rotate the adjustable center as needed to line up the cup center with the drill chuck, then tighten the set screw.

    b. To adjust the cup center point **vertically**, loosen the mount lock, then loosen the tailstock stop collars. Raise or lower the tailstock in the base mount until the cup center point vertically lines up with the drill chuck, then tighten the mount lock. Press the stop collars down firmly against the base mount and tighten the collar set screws, as shown in Figure B-118.

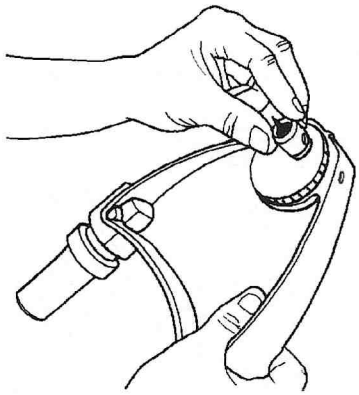


Figure B-115

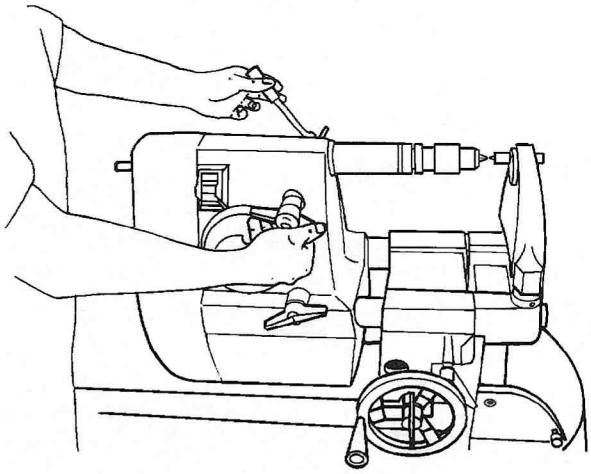


Figure B-116

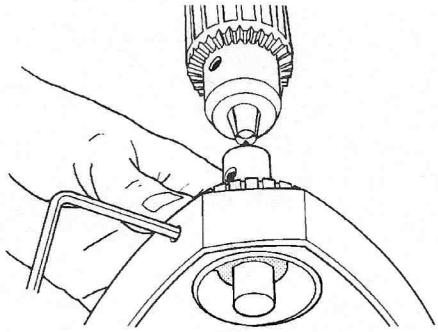


Figure B-117

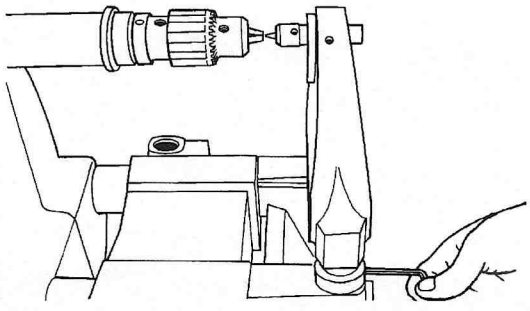


Figure B-118

NOTES

Mode Setups

The Mark V Model converts to five modes– table saw, disc sander, drill press, horizontal boring, and lathe.

NOTE

These Mode Setup procedures assume that there is nothing mounted to any spindle and all alignments and adjustments have been completed.

One of the most useful features about the Mark V is that you can "borrow" angles and setups from one mode to the other. This greatly improves the accuracy of your woodworking.

To "borrow" a setup, don't break down the machine completely as you change from mode to mode. For example, if you need to cut a miter, sand it smooth, and then bore for dowels, keep the table and the miter gauge in the same position as you move from table sawing to disc sanding to horizontal boring. This will ensure that your stock is cut, sanded, and bored precisely the same. It also saves you setup time.

As you change from one mode to another, keep these four safety rules in mind:

1. **Turn the speed dial to "Slow," then turn off and unplug the Mark V before you break down one mode and set up another.** Always have the speed dial set to "Slow." It is dangerous for both you and your electrical circuit to start accessories at high speed (i.e., the sanding disc can blow fuses at table saw speed and the lather will throw stock at rout-shape speed).

2. **Make sure that accessories are properly mounted on the main spindle.** The flat on the main spindle is ground with a "reverse taper" to keep accessories secured.

   a. To properly mount an accessory, push it onto the main spindle **all the way**. Then use a 5/32" Allen wrench to tighten the setscrew against the flat of the spindle. (See Figure B-119.) To make sure the accessory is securely mounted, rock the accessory back and forth slightly as you tighten the setscrew and then again after it is tight, while keeping the spindle from turning. If the accessory seems to loosen, tighten the setscrew again until you've removed any "play."

3. Check all locks before turning on the machine. To properly secure a lock, spin it until it stops, then tighten it an extra 1/4 turn.

CAUTION

Be careful not to overtighten locks. Overtightening locks may damage the way tubes, table support tubes, or other parts of the machine.

To be sure all locks are as they should be, make a five-point check before you turn on the Mark V. With a clockwise sweep of your hand, check each of these locks in succession: table tilt lock, carriage lock, table height lock, headstock lock, and quill lock. See Figure B-120. The carriage lock handle must be secured in the horizontal position. The quill lock should be loose in the drilling

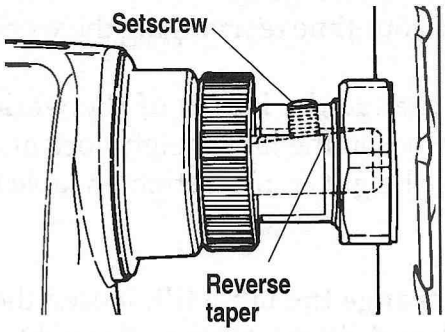


Figure B-119

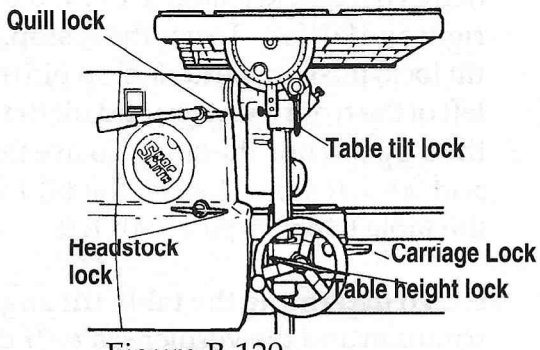


Figure B-120

and boring modes, and for some sanding operations. In the lathe mode, this procedure becomes a four-point check, since the table has been removed.

When changing from a horizontal to a vertical position, secure the base lock. When changing from vertical to horizontal, secure the headrest lock. If you're mounting accessories in the power mount or base mount, secure the mount locks.

CAUTION

DO NOT turn speed dial without machine running.

4. **After you turn on the Mark V, but before you begin working, set the correct speed for the operations.** This is important! It's unsafe to run the latter at table sawing speeds, and time-consuming to run the table saw at lathe speeds. To find the proper speeds, refer to the "Speed Charts" in the Operations section.

The worktable and other accessories are often used in more than one mode:

Worktable

1. When you change modes, you will spend most of your time rearranging the worktable.

   a. To change the height of the worktable, simply loosen the table height lock and turn the table height crank. Retighten table height lock.

   b. To change the table tilt, loosen the table tilt lock and tilt the table to the right or left. The table tilt mechanism has positive stops to help you quickly adjust the table to 0°, 45° right and 90° left. To use the 0° stop, loosen the tilt lock, push in the table stop pin on the front left of the front trunnion and tilt the table until the stop pin hits the stop. To use the 45° right and 90° left stops, loosen the tilt lock and tilt the table to 45° right or 90° left.

   c. To determine the table tilt angle, use the trunnion and the vernier scale. If the desired angle is divisible by 5, align the angle on the trunnion with 0° on the scale. To set an angle that is not divisible by 5, first find the nearest angle that is divisible by 5 and is smaller than the desired angle. For example, if you want to tilt the table to 17°, the nearest angle that is smaller than 17° but divisible by 5 is 15°. Next, subtract the smaller angle from the desired angle, 15° - 17° = 2°. Tilt the table so that the 15° mark on the trunnion goes 2° past the 0° mark on the scale. See Figure B-121.

   d. To dismount the worktable, raise the table above the blade and slide the carriage to the right. Tilt the table 90° left and lock. Loosen the table height lock and pull the table straight up. See Figure B-122.

   e. To remount the worktable, loosen the table height lock and place the support tubes in the carriage. Be sure the racks face to the

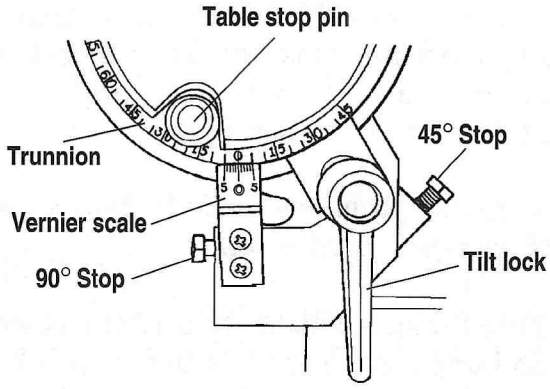


Figure B-121

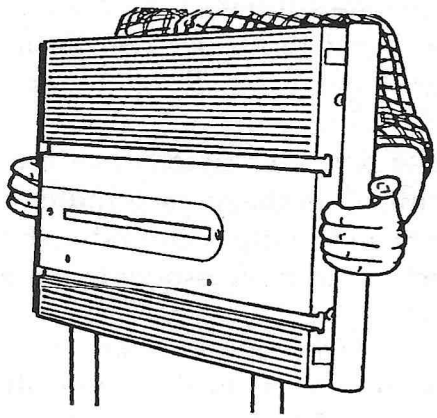


Figure B-122

right away from the headstock. Gently rock the table front-to-back until the racks engage the pinions and the tubes drop smoothly into the holes. Sometimes it helps to slowly turn the table height crank clockwise while you rock the table. This will position the support tubes at exactly the same height and get the racks started properly in the pinions. Lower the table, loosen the tilt lock, set the desired position and secure the tilt lock.

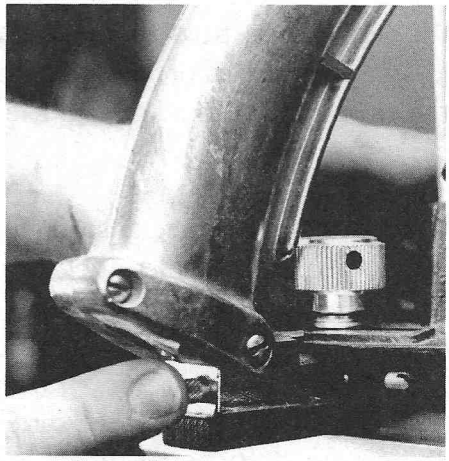


Figure B-123

Accessories

The miter gauge, rip fence and extension table are designed to be used in more than one mode.

Miter Gauge

1. The miter gauge mounts in the worktable slots. The face of the miter gauge angles from 30° right to 30° left (a 120° swing) and has three positive stops— 90°, 45° right, and 45° left. To use the stops, loosen the lock knob, push in the plunger and turn the miter gauge until the stop hits the plunger. See Figure B-123.

2. When the miter gauge is in the desired position, spin the knob tight and insert the long 5/32" Allen wrench in one of the holes in the knob to tighten it an extra 1/4 turn. See Figure B-124.

3. The miter gauge slides or locks in the slots. To lock the miter gauge bar in the slot, put

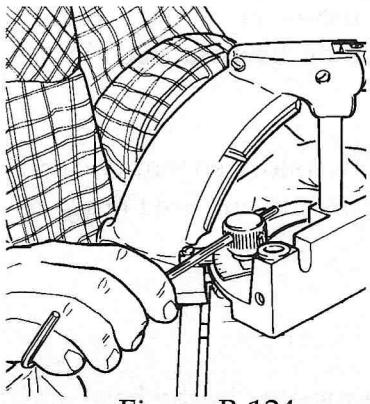


Figure B-124

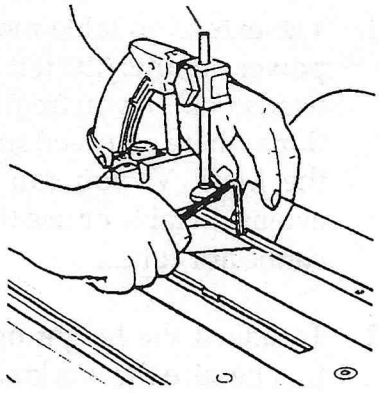


Figure B-125

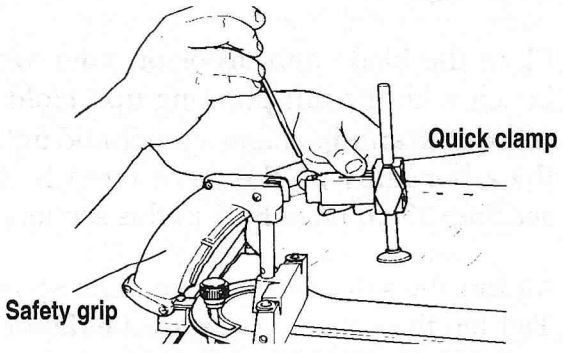


Figure B-126

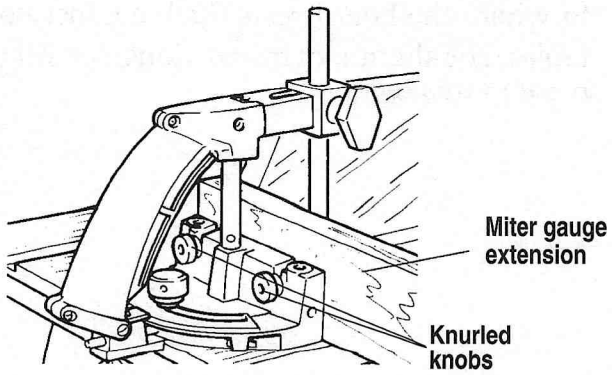


Figure B-127

a piece of paper under the bar and mount the bar in a slot. Then turn the tapered screw located in the middle of the bar clockwise until the miter gauge is secure in the slot, as seen in Figure B-125.

4. The miter gauge has a special safety grip and quick clamp that helps hold stock securely in the miter gauge. The quick clamp can be adjusted to accommodate any size stock up to 4-1/4" thick simply by loosening the knob and raising or lowering the rod and shoe assembly. If you need to perform an operation where the quick clamp would be in the way, you can remove it by loosening the setscrew at the top, near the back of the arm. See Figure B-126.

5. The miter gauge has two slots, so that you can attach a miter gauge extension. See Figure B-127.

Extension Table

1. The extension table mounts in the base and power mounts (the left and right sides of the headstock). If you frequently perform operations where you need support on both ends of the Mark V, you can order an additional extension table or use the telescopic legs and connector tubes.

2. To adjust the height of the extension table, first be sure the worktable height is set properly. Then lay a long, straight board across both tables. Raise or lower the extension table to where the board rests flush against both tables. For alignment instructions, see Alignment in this section.

Setting Up the Table Saw Mode

1. Turn the speed dial to "**Slow**", then turn off and unplug the Mark V.

2. Position the headstock so that you can reach the main spindle. Tighten the quill lock.

3. Mount the lower saw guard on the quill so that the stop screw below the collar butts against the stop collar on the quill. Align the ridge on the headstock with the slot in the collar. Tighten the screw on the collar. See Figure B-128. Loosen the two knobs and slide the guard cover to the right.

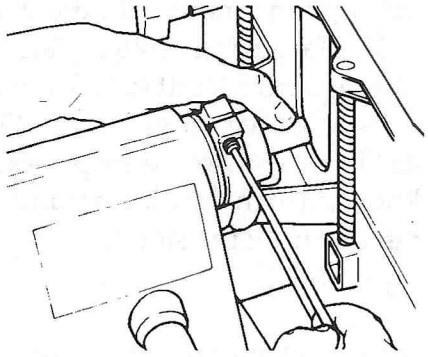


Figure B-128

4. Mount the saw blade on the arbor. Remove the arbor nut by turning it clockwise. Hold the arbor with the threaded part pointing to the left. Mount the blade with the teeth pointing toward you. Replace the nut and finger tighten.

5. Place the blade and arbor on your workbench with the nut pointing up. Hold the arbor with an adjustable wrench and tighten the arbor nut with the arbor wrench. Also see Step 19 on page B-25 in this section.

6. Mount the saw blade on the main spindle. Tighten the setscrew against the flat of the

spindle. Slide the guard cover in toward the blade.

CAUTION

Always move the guard cover in toward the blade before lowering the worktable. Otherwise, you will damage the guard.

7. Raise the worktable as high as it will go. Slide the carriage toward the headstock until it butts against the rubber spacer. Lower the worktable so that the blade protrudes 1/4" higher than the thickness of the stock. The blade should be centered in the table insert. Secure the table height and carriage locks.

8. Install the upper saw guard. Grasp the top of the riving knife, with the guard up, and slide the guard through the table insert into the lower saw guard. See Figure B-129. Tighten the guard lock knob.

WARNING

When the riving knife is properly installed, it will be 1/8" from the saw blade. If the clearance is greater than 1/8", the riving knife needs to be checked. It should not be binding against the back of the table insert.

Also, always secure the guard lock knob even when the upper saw guard is not being used.

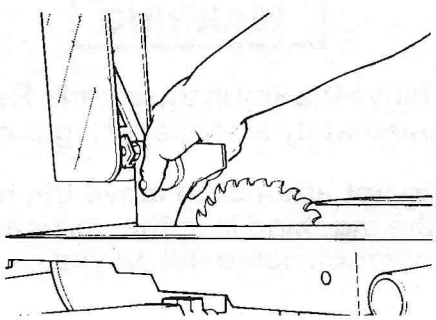


Figure B-129

9. Check all locks. The table tilt lock, carriage lock, table height lock, headstock lock and quill lock should all be securely tightened.

Setting Up the Disc Sander Mode

1. Turn the speed dial to "Slow", then turn off and unplug the Mark V.

2. Mount the sandpaper on the sanding disc. If you are mounting sandpaper for the first time, clean the disc with denatured alcohol and a clean rag to remove the protective oil. Otherwise the sandpaper will not stick. Press the sandpaper firmly on the disc and smooth it from the center toward the edge.

NOTE

To remove worn-out paper, peel it off the disc. Then clean the disc with denatured alcohol. To make it easier to remove the sandpaper, heat the sanding disc in an oven at a maximum temperature of 150° (in a convential oven).

3. Position the headstock so that you can reach the main spindle.

4. Mount the lower saw guard on the main spindle and open it up by loosening the cover lock knobs and sliding the cover to the right. Tighten the guard lock knob.

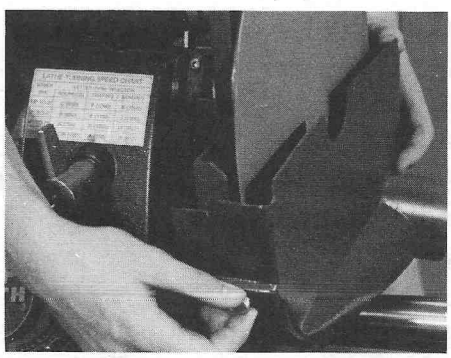


Figure B-130

5. Mount the sanding disc all the way onto the main spindle. Tighten the setscrew against the flat of the spindle. Move the guard cover towards the disc until it is 1" away. Tighten the two knobs. See Figure B-130.

6. Position the table 1/16" away from the disc 1/2" away if you are going to use the quill feed. Adjust the table height so that the table surface is slightly above the center of the disc.

   --For angle sanding, raise the table above the disc and slide the table to the left until the disc aligns with the table slot. Loosen the cover lock knobs and slide the guard cover toward the disc as far as possible. Lower the table over the disc. Tilt the table to the desired angle while extending the quill. Slide the guard cover to the right until it hits the tie bar. Secure the lock knobs.

7. Check all locks. The table tilt lock, carriage lock, table height lock, headstock lock and quill lock (if not used) should be securely tightened.

WARNING

Do not attempt to move the headstock when the machine is in the vertical position; the headstock could fall on you.

Setting Up the Vertical Drill Press Mode

1. Turn the speed dial to "Slow", then turn off and unplug the Mark V.

2. Position the headstock 10" away from the headrest (right side), and the carriage 20" away from the base mount. Tighten the headstock and carriage locks. **DO NOT OVER TIGHTEN.**

3. Position the worktable surface just above the top of the headstock. Tighten the table height lock. Then loosen the tilt lock and tilt the table to the left 90°. Tighten the tilt lock.

4. Mount the drill chuck all the way onto the main spindle. Tighten the setscrew against the flat of the spindle.

5. Loosen the headrest lock. Grasp the way tubes with both hands, one hand to the left of the headstock and the other to the right, then raise the machine into the vertical position. Tighten the base lock, rock the way tubes side-to-side. Retighten if possible. This helps to take the play out of the base pivot and keeps the Mark V from wobbling.

NOTE

The base lock does not fit dead center in the hole, but off to one side, as shown in Figure B-131.

6. Move the quill feed handle to the back of the headstock if you desire.

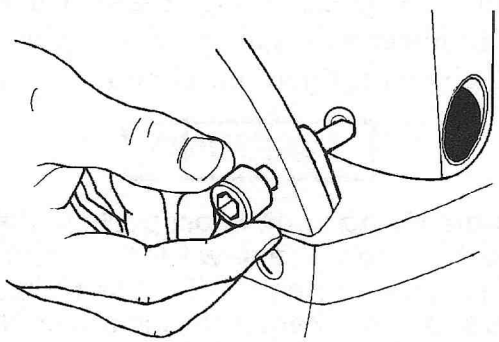


Figure B-131

7. Mount a drill bit in the chuck and tighten with the chuck key.

WARNING

Never leave the key in the chuck. Remove the key immediately after securing the bit.

Also, do not attempt to move the headstock when the machine is in the vertical position; the headstock could fall on you.

8. Check all locks. The table tilt, carriage, table height, headstock and quill (if not used) locks should be secure.

Setting Up the Horizontal Boring Mode

1. Turn the speed dial to "**Slow**", then turn off and unplug the Mark V.

2. Position the headstock so that you can reach the main spindle.

3. Mount the drill chuck all the way onto the main spindle. Tighten the setscrew against the flat of the spindle.

4. Position the worktable edge 4" away from the drill chuck. Adjust the table height so that the table is below the drill chuck.

5. Mount a drill bit in the chuck and tighten with the chuck key.

WARNING

Never leave the key in the chuck. Remove the key immediately after securing the bit.

6. Check all locks. The table tilt lock, carriage lock, table height lock, headstock lock, and quill lock (if not used) should all be securely tightened.

Setting Up the Lathe Mode

1. Turn the speed dial to "**Slow**", then turn off and unplug the Mark V.

2. Dismount the worktable. Tilt the table to the left 90° and lock it. Loosen the table height lock and pull the table straight up.

3. Position the headstock so that you can reach the main spindle.

4. Mount the tool rest in the carriage so the rack engages the pinion.

5. Mount the drive center all the way onto the main spindle. Tighten the setscrew against the flat of the spindle.

6. Mount the tailstock in the base mount (right side) and tighten the accessory mount (left side) lock.

NOTE

When you get ready to break down the lathe mode, you will probably find the cup center is "stuck" in the tailstock. If this is the case:

a. Remove the tailstock from the machine.

b. Lay it over the edge of a workbench so the eccentric mount is supported by the table and the center is hanging free.

c Tap the back side of the center with a nylon or rawhide mallet to pop it loose. Do not use a metal hammer. Hold the center with your free hand so the center does not fall to the floor. Be careful of the sharp point in the center pin.

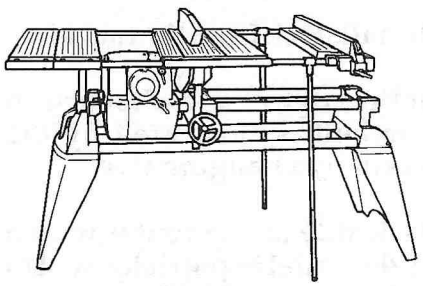
7. Mount the cup center in the tailstock with the point toward the headstock.

8. Check all locks. The carriage lock, table height lock, headstock lock, and quill lock should all be securely tightened.

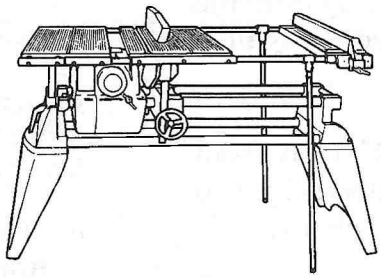
Optional Setups with Floating Extension Tables, Connector Tubes and Telescoping Legs

The following illustrations are examples of various setups, using both standard and optional floating extension tables, connector tubes and telescoping legs. You should consider these setups for efficiency, ease of use, and safety.

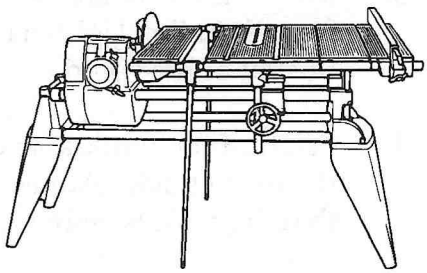
The standard extension table kit with the Model 520 – one floating extension table, two connector tubes and two telescoping legs. Safety, setup and other information is found in the instructions packed with the extension table kit.



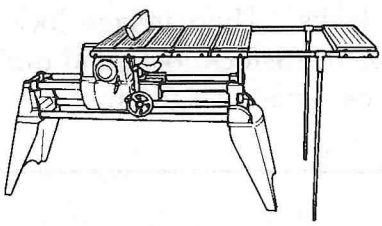
2 Floating Tables
4 Connector Tubes
2 Telescoping Legs



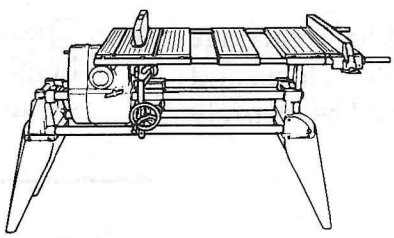
2 Floating Tables
4 Connector Tubes
2 Telescoping Legs



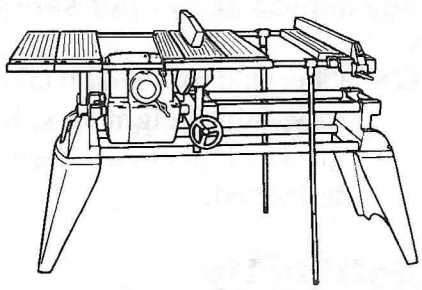
2 Floating Tables
4 Connector Tubes
2 Telescoping Legs



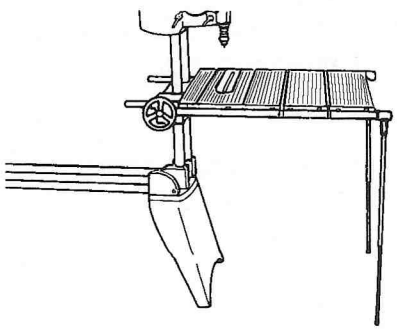
2 Floating Tables
4 Connector Tubes
2 Telescoping Legs



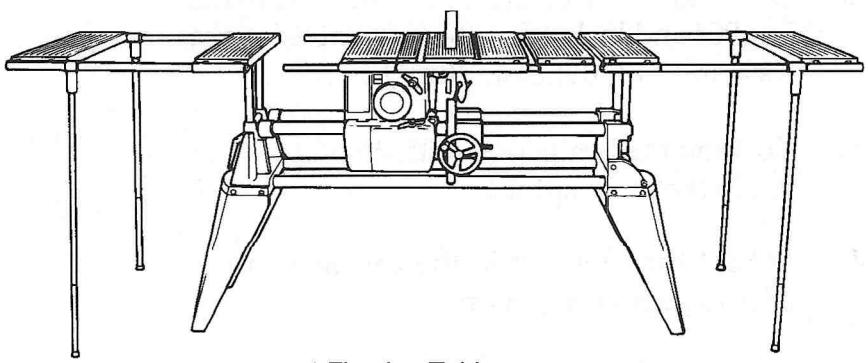
2 Floating Tables
4 Connector Tubes



2 Floating Tables
4 Connector Tubes
2 Telescoping Legs



2 Floating Tables
2 Connector Tubes
2 Telescoping Legs



4 Floating Tables
8 Connector Tubes
4 Telescoping Legs

Table Sawing Operations

TABLE SAWING SPEED CHART]

Operation	Hardwood	Softwood
General Sawing	R (3500 rpm)	R (3500 rpm)
Heavy Ripping	O (2800 rpm)	P (3000 rpm)
Trim Cuts	S (3800 rpm)	S (3800 rpm)

Safety

WARNING

Before performing table sawing operations:
- **Read and understand, and follow the SAFETY section, especially for the table saw mode.**
- **Complete ALL the Assembly and Alignment procedures.**
- **Set up the table saw mode according to the instructions found in your Mark V Model's section.**
- **Secure locks.**

Table Sawing Speeds

NOTE

The speeds designated on the speed charts are suggested speeds.

Before you begin any table saw operation, know the correct speed at which to set the speed dial. The correct speed is determined by the operation and the type of stock you're sawing. To determine the right speed for the job, refer to the Table Sawing Speed Chart.

NOTE

Adjust the speed dial only when the motor is running.

Crosscutting

General Crosscutting

1. Place the miter gauge in the slot on the same side of the saw blade where you'll be standing. Position the miter gauge square to the blade.

2. Mark the board where you want to cut it. Set the stock against the protractor face. Adjust the stock so the blade cuts on the waste side of the line. Adjust the quick clamp to the thickness of the stock.

3. Set the stock against the miter gauge face, so that the blade cuts on the waste side of the line.

4. Squeeze the safety grip and turn on the Mark V. Set to the correct speed, then guide the stock past the blade. Use your free hand to help keep the stock against the miter gauge face. See Figure C-1.

NOTE

When crosscutting stock resulting in narrow scrap, move the blade close to the table insert on the scrap side of the blade. This will help keep small pieces of stock from falling through the insert.

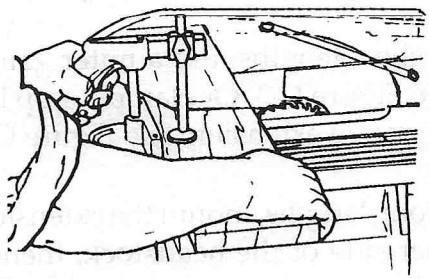


Figure C-1

5. Don't feed the stock any faster than the saw will cut. If the machine bogs down, slow your feed rate and let the saw get back up to running speed.

6. When you've finished the cut, turn the speed dial to "Slow" and turn off the Mark V. Let the blade come to a complete stop, then remove the stock from the miter gauge and brush away scraps.

WARNING

Always let the blade come to a complete stop before removing stock or scrap. Also, if you need to actually touch the blade, make sure the Mark V is turned off and unplugged.

Crosscutting Long Stock

7. Mount an extension table in the power or base mount located at either end of the Mark V. Use a miter gauge extension to help keep the stock square to the blade. Start by cutting long stock in the middle. This gets it down to a manageable length. See Figure C- 2.

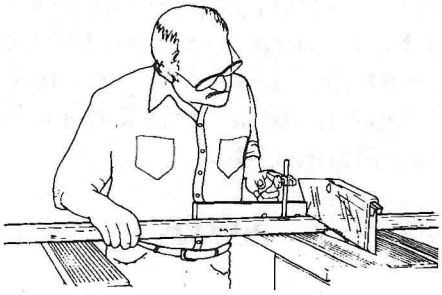


Figure C-2

Crosscutting Duplicate Lengths

8. To cut short lengths, use a miter gauge stop rod. See Figure C-3. Or clamp a stop block to a miter gauge extension. See Figure C-4.

9. To cut long lengths, mount the extension table on either side of the headstock, then mount the rip fence on the extension table. Clamp a stop block to the rip fence. Position the stop block ahead of the blade.

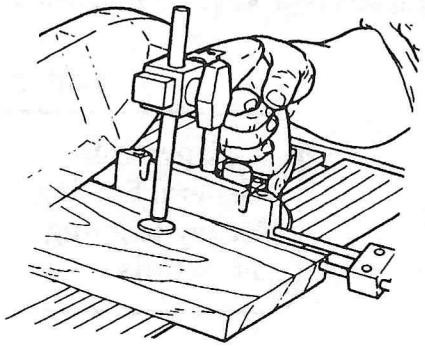


Figure C-3

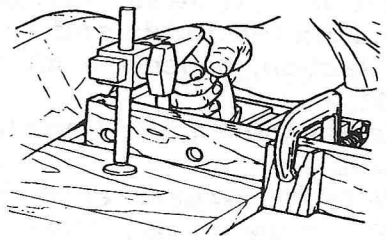


Figure C-4

WARNING

Never use the rip fence for crosscutting unless you clamp a stop block to it. If the stock contacts the rip fence as it passes the saw blade, the stock will bind and be kicked back.

10. Move the headstock and carriage so that the saw blade is the proper distance from the stop block. Make fine adjustments with the quill feed. Then butt the stock against the stop block and clamp the stock with the safety grip. See Figure C-5.

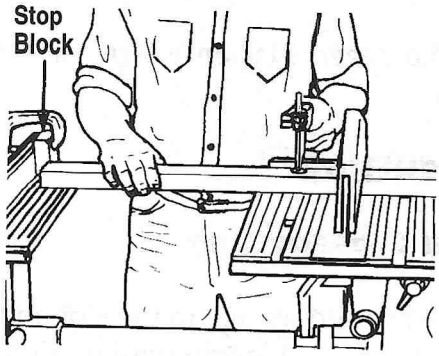


Figure C-5

Ripping

WARNING

When ripping, make sure the rip fence is parallel to the blade and that the edge of the stock against the fence is straight. Otherwise you're likely to get a kickback.

Also, never reach over or around the blade to catch your stock, even with the upper saw guard in place. A kickback can drag your hand back under the guard and into the blade.

General Ripping

1. Mount the rip fence to the worktable. Move the fence the desired distance away from the saw blade, then lock it. Use the quill feed to make fine adjustments. See Figure C-6.

NOTE

When properly aligned, the rip fence automatically sets itself parallel to the blade. However, on critical setups, it's wise to check this. Measure the distance from the rip fence to the tip of a saw tooth (that is set toward the fence) at both the front and back of the machine.

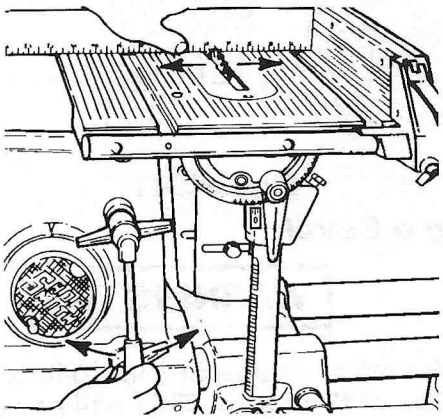


Figure C-6

2. Mount a feather board in front of the blade to help hold the stock against the fence.

WARNING

Always mount the feather board in front of the blade. Otherwise you could create a kickback.

3. Turn the machine on and set the correct speed. Feed the stock into the blade while keeping it pressed firmly against the fence. Use a push stick or push block to finish the cut. See Figure C-7.

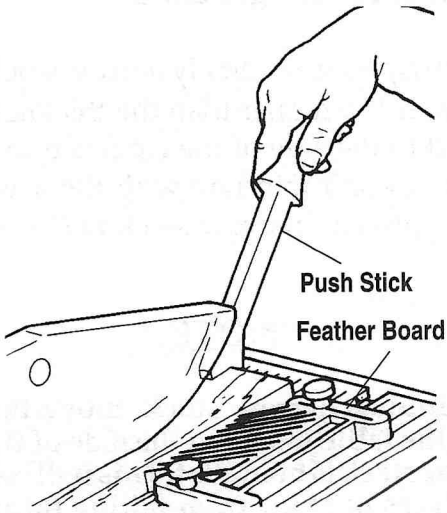


Figure C-7

Ripping Long Stock

4. Position roller stand(s) 1' to 4' out from the back and/or front of the table. Adjust the stand(s) so the stock rests flush on the table, then lock the roller stand(s). You can also use it as a support table. See Figure C-8.

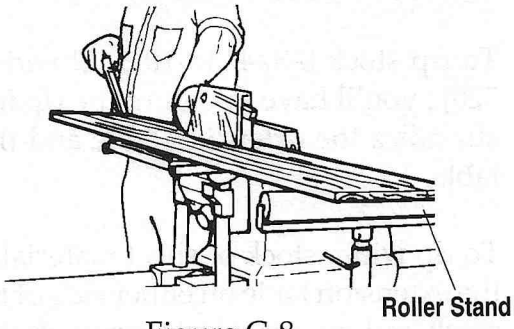


Figure C-8

Ripping Narrow Stock

5. When ripping stock less than 1-1/2" wide, use the fence straddler to finish the cut. See Figure C-9.

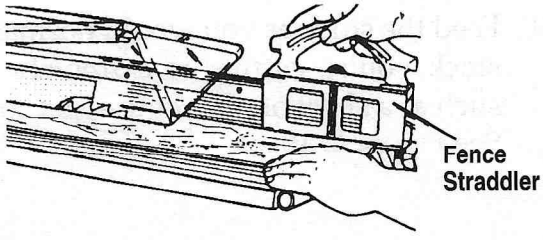


Figure C-9

WARNING

Always use a push stick or fence straddler when ripping narrow stock. Keep your fingers out of the danger zone.

6. When ripping extremely narrow stock, clamp a spacer (no higher than the thickness of the stock) to the side of the rip fence so that the fence doesn't interfere with the saw guard. Use a piece of narrow stock to complete the cut.

NOTE

When ripping narrow stock, move the blade close to the table insert on the side of the blade where the stock is being cut. This will help keep small pieces of stock from falling through the insert.

Ripping Wide Stock

WARNING

DO NOT rip large sheets of plywood or similar materials by yourself. Use roller stands and get at least one helper.

7. To rip stock 8-3/4" to 10-3/4" wide (Model 520) , you'll have to mount the rip fence so it straddles the extension table and the worktable.

8. To rip wider stock or sheet materials, mount the extension table on either side of the headstock and mount the rip fence on the extension table. Move the headstock and the carriage until the blade is the desired distance away from the rip fence. Use the quill feed to make fine adjustments.

9. Feed the stock as you would normally. If the stock you're cutting is extremely large — such as a sheet of plywood — get some help. See Figure C-10.

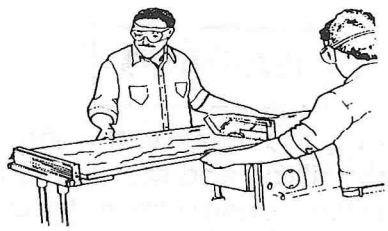


Figure C-10

Angles

Cutting a Miter

1. Set the miter gauge at the desired angle, and secure the lock knob. Place the miter gauge in one of the slots so that the protractor face is angled toward the blade.

2. Mark the stock where you want to cut it. (It's easiest to measure from the outside corners of the miter.) Clamp the stock in the miter gauge and line it up with the blade. From this point on, the procedure is similar to crosscutting. See Figure C-11.

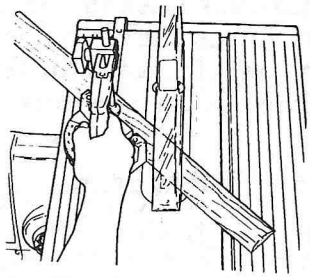


Figure C-11

Cutting a Bevel

WARNING

Mount the miter gauge or the rip fence on the down side of the table. This will provide better support for the stock, help eliminate kickbacks, and keep your hands out of danger. When cutting a bevel, mounting the miter gauge on the up side of the blade could result in the protractor casting coming in contact with the saw blade.

3. Slide the carriage and the headstock all the way to the right and set the table at the desired angle. If you're crosscutting a bevel, mount the miter gauge on the down side of the table.

See Figure C-12. If you're ripping a bevel, mount the rip fence on the down side of the table. See Figure C-13.

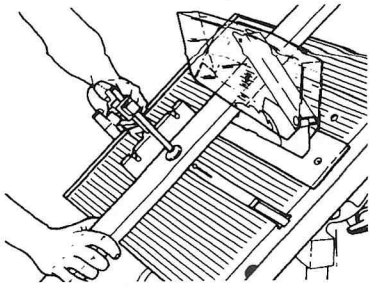


Figure C-12

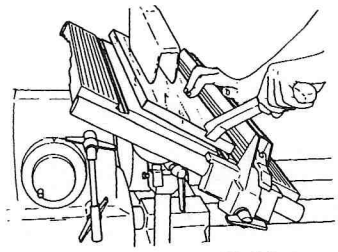


Figure C-13

4. When ripping a bevel in stock narrower than 1-1/2" wide, you'll need to mount an appropriately thick piece of stock to the rip fence. This fence extension will position the ripping face closer to the blade for narrower cuts.

5. When ripping a bevel in wide stock, you may not be able to mount the rip fence on the extension table. In this case, clamp a long, straight board to the underside of the stock and rest this board over the upper edge of the table. When properly positioned, the board will guide the stock. See Figure C-14.Mount the rip fence on the floating table.

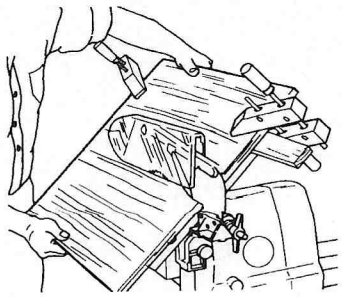


Figure C-14

Cutting a Compound Miter

6. To cut a compound miter, adjust both the table and the miter gauge to their desired angles.

Rabbets and Dadoes

WARNING

Rabbets and dadoes are made with the upper saw guard removed. Whenever you remove the upper saw guard, keep the lower guard in place and make sure the lock knob is secured. Always use a push stick, push block, or other safety equipment to help keep your hands out of danger. NEVER put hands over the blade even if the blade is covered by the stock.

Cutting a Rabbet

1. Remove the upper saw guard, adjust the table height, and mount the rip fence to the table the desired distance away from the blade. Make fine adjustments with the quill feed.

2. Rabbet cuts require two passes. Cut the surface of the stock first. See Figure C-15. Then reposition the fence if necessary and turn the stock on edge. Make the second cut so that the waste is on the opposite side of the blade from the rip fence. Use a fence extension or feather board to support the stock. See Figure C-16.

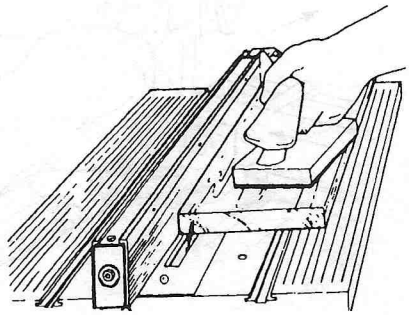


Figure C-15

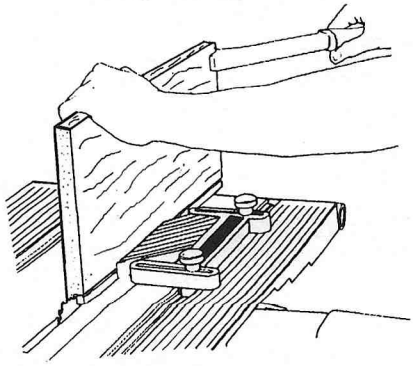


Figure C-16

Cutting a Dado

3. Remove the upper saw guard and adjust the height of the table.

WARNING

Make sure the next step is done with the machine turned offf.

4. To determine where to start and stop cutting, first find the right and left sides of the dado. Mark the dado on the stock and place it in the miter gauge. Grip stock in the safety grip and move it up to the blade. With a pencil, mark the right and left sides of the kerf on the worktable surface. These marks will serve as a temporary guide.

5. Line up the right side of the dado with the right kerf mark and make your first pass. Move the stock to the right the width of one kerf and make another pass. Continue until the left side of the dado lines up with the left kerf mark, then make your last pass over the blade. See Figure C-17.

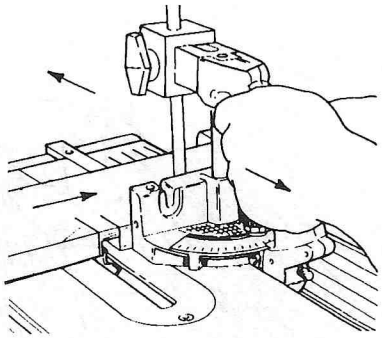


Figure C-17

Disc Sanding Operations

DISC SANDING SPEED CHART

Grit	Hardwood	Softwood
Coarse (60#)	D (1050 rpm)	E (1150 rpm)
Medium (80#)	F (1300 rpm)	G (1450 rpm)
Fine (100#)	G (1450 rpm)	H (1600 rpm)

Grinding or Sharpening Metal Tools — Slow (700 rpm)

Safety

WARNING

Before performing disc sanding operations:

- **READ, UNDERSTAND, and FOLLOW the SAFETY section, especially for the disc sander mode.**
- **Complete ALL the Assembly and Alignment procedures.**
- **Secure locks.**

Disc Sanding Speeds

NOTE

The above mentioned speeds are reccommended speeds.

Before you begin any disc sanding operation, know the correct speed at which to set the speed dial. The correct speed is determined by the operation and the type of material you're sanding. To determine the right speed for the job, refer to the Disc Sanding Speed Chart.

General Sanding

Position the carriage so that the table is no farther than 1/16" away from the disc (if you're not using the quill feed), or 1/2" (if you are using the quill feed). Maintain these clearances during sanding. Position the table surface near the center of the disc. Maintain these clearances during sanding. Always sand on the downward motion side of the disc with the disc either through the insert or next to the table.

End-Grain Sanding

1. Mount the miter gauge in the left slot and position it so that it will guide the stock against the downward side of the disc. Then lock the gauge in the slot. Turn on and set the Mark V speed.

NOTE

When end-grain sanding, set the speed a little slower than you would for other types of sanding. End grains "burn" easily.

2. If you're feeding the stock into the disc, place the stock against the miter gauge and feed it toward the disc until it contacts the abrasive. Hold it there for a few seconds, back it off, then feed it forward again. See Figure C-18.

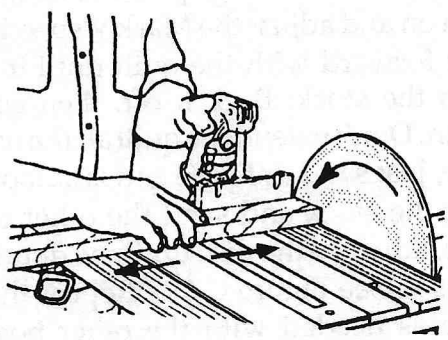


Figure C-18

3. If you're using the quill feed, advance the disc until it contacts the stock. Hold it there for a few seconds, back it off, and feed it forward again. See Figure C-19.

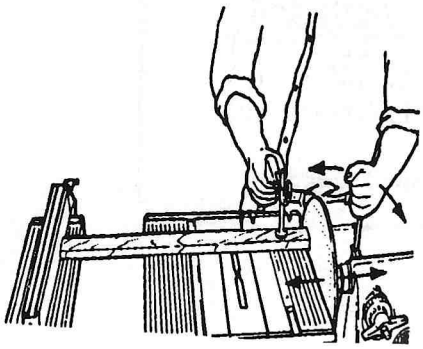


Figure C-19

Sanding to Length

1. Mount the rip fence to the table or the extension table to use as a backstop. Position the backstop so it holds the end of the stock about 1/2" away from the sanding disc when the quill is completely retracted.

2. Adjust the quick clamp to the thickness of the stock. Mount and lock the miter gauge in the left slot. Set the depth control. Position the stock against the miter gauge and the rip fence, so that it overhangs the table slightly. Be sure the stock doesn't contact the sanding disc.

3. Squeeze the safety grip with one hand, then turn on and adjust the Mark V speed.Feed the disc forward with the quill until it just contacts the stock. Back it off, then advance it again. Don't extend the quill all the way at this time, just sand until the end is smooth. Then, turn the stock and sand the other end. This time, advance the disc until the depth control stops it. See Figure C-20. Repeat this procedure as needed with the other boards you need to sand. When finished, they will all be exactly the same length.

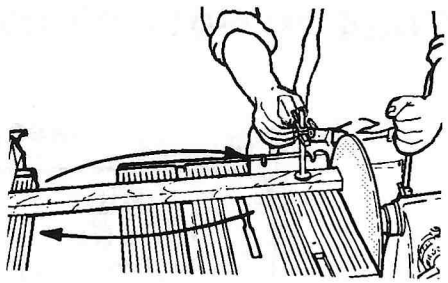


Figure C-20

Sanding Bevels, Chamfers, and Miters

1. After sawing a miter, bevel or chamfer, don't change the table tilt or the miter gauge angle. Instead, use these angles for the sanding setup.

2. Remove the upper saw guard, raise the table and remove the saw blade from the lower saw guard. Mount the sanding disc in the guard, then re-adjust the table height and position for sanding. Clamp the stock in the miter gauge or guide it against the rip fence, and sand it at the same angle that you cut it.

NOTE

When sanding angles, position the disc through the insert.

NOTES

Vertical Drilling Operations

VERTICAL DRILLING SPEED CHART

Size of Hole	Hardwood	Softwood
1/4" and less	H (1600 rpm)	I (1750 rpm)
1/4" to 1/2"	F (1300 rpm)	G (1450 rpm)
1/2" to 3/4"	D (1050 rpm)	E (1150 rpm)
3/4" to 1"	B (850 rpm)	C (950 rpm)
Over 1"	Slow (700 rpm)	A (750 rpm)

Drilling metals (twist bits only) — Slow (700 rpm)

Safety

WARNING

Before performing vertical drilling operations:

- **Read the SAFETY section, especially for the drill press mode.**
- **Complete ALL the Assembly and Alignment procedures.**
- **Set up the drill press mode according to the instructions found in your Mark V Model's section.**
- **Remove the key from the chuck.**
- **Secure locks.**

Vertical Drilling Speeds

NOTE

The above referenced speeds are suggested speeds.

Before you begin any vertical drilling operation, know the correct speed at which to set the speed dial. The correct speed is determined by the operation and the type of material you're drilling. To determine the right speed for the job, refer to the **Vertical Drilling Speed Chart.** This chart is intended as a general guide when using **brad-point bits** and **twist bits.** If you use other bits, follow the manufacturers recommendations.

General Drilling

There are two basic types of holes: holes that you drill completely through the stock, and holes that only go part way through the stock.

Drilling Through

1. Mount the rip fence on the table to use as a backstop. (If there's no room for the rip fence, use the miter gauge).

2. Clamp a scrap of wood on the table to keep the drill bit from drilling into the table and the stock from splintering where the drill bit exits. This scrap should be wider than the stock.

3. Mark the holes on the stock, and lay it on top of the scrap. Adjust the rip fence to position the hole where you want it. Make fine adjustments with the table height crank. See Figure C-23.

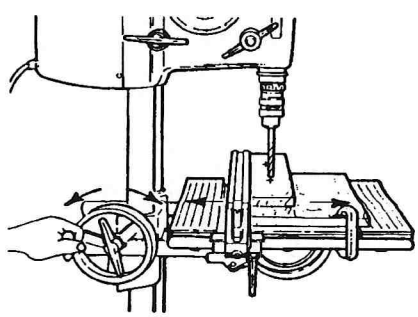


Figure C-23

4. To position the table assembly on the way tubes, hold the carriage so that it won't drop against the base mount, then loosen the carriage lock. Adjust the table height so that the tip of the drill bit is 1/4"-1/2" above the stock, and tighten the lock.

5. Remove the stock and extend the quill so that the cutting flutes of the drill bit touch the scrap wood. Set the depth control to 1/8" and tighten the depth control lock. See Figure C-24. Then let the quill retract. Position the stock under the drill bit. Hold it against the table and rip fence. Extend the quill with the machine off to check where the drill bit will drill.

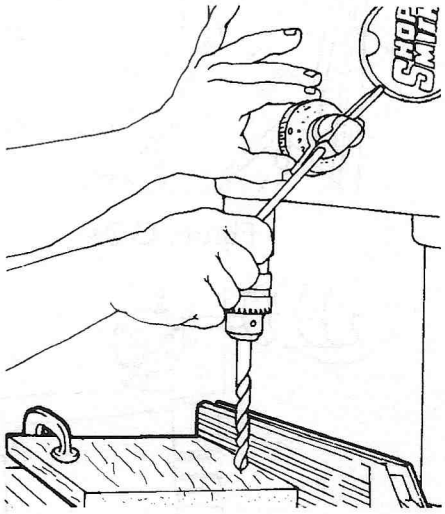


Figure C-24

6. Turn on the Mark V, adjust the speed, and feed the drill bit into the stock slowly. See Figure C-25. When drilling deep holes, retract the drill bit now and then to clear chips from the hole. When you feel the depth control stop the quill, retract the drill bit. Turn the speed dial to "Slow" and turn off the machine. Let it come to a stop, then remove the stock.

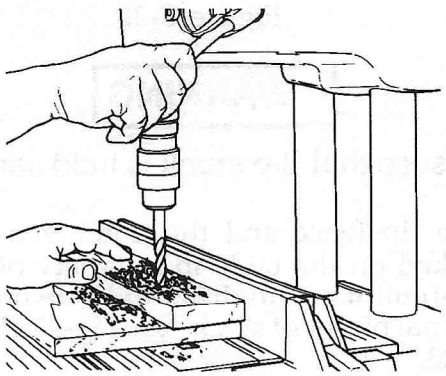


Figure C-25

Drilling Part Way

1. Same as "Drilling Through" except extend the quill until the cutting flutes of the drill bit just touch the stock. Then set and lock the depth control. See Figure C-26.

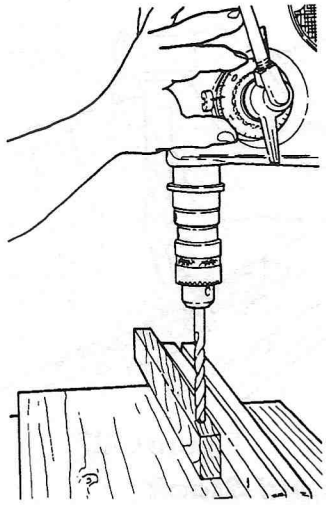


Figure C-26

2. Then drill the holes you need. The depth control will stop the quill when the drill bit reaches the proper depth in the stock. All the holes you drill at any one depth control setting will be exactly the same depth.

Avoiding Tear-Out

1. Prevent rough, splintery edges where the drill exits the stock by moving the scrap block every time you drill a new hole- this way there's always a firm surface to back up the stock. Or, if you're using brad-point drill bits, you can use the depth control to avoid tear-out.

2. With the Mark V turned off, extend the quill until the pilot of the brad point drill bit touches the scrap wood. Lock the quill. Set the depth control to "0" and lock it in place. Unlock the quill and let it retract.

3. Drill the holes you need, letting the depth control stop the quill. Set the speed dial to "Slow", turn off the Mark V, and turn the stock over. There will be a tiny pinhole where the pilot started to come through the stock. Use this pinhole to line up the drill bit, then finish drilling the hole from the other side. Since brad-point drill bits have spurs that cut the wood grain smoothly when they enter the wood, there will be no tear-out on either side of the stock.

Drilling at an Angle

1. Mount the rip fence on the downside of the table, then tilt the table. This will give the stock maximum support. If the angle is acute, place scrap blocks on the table and rip fence. See Figure C-27.

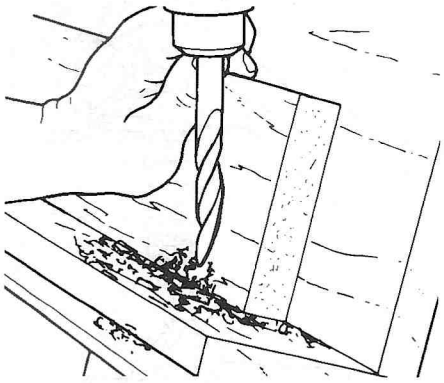


Figure C-27

Drilling Round Stock

WARNING

Make sure that the stock is held securely.

1. Position the rip fence in the middle of the table and tilt the table at 45 degrees. This will create a 'V' to cradle the stock.

2. If you're going to drill through the stock, protect the table and the rip fence with scrap wood. If you perform this operation often, you may want to make a V-support by gluing two scrap boards together, then bolt one side of the support to the rip fence. See Figure C-28.

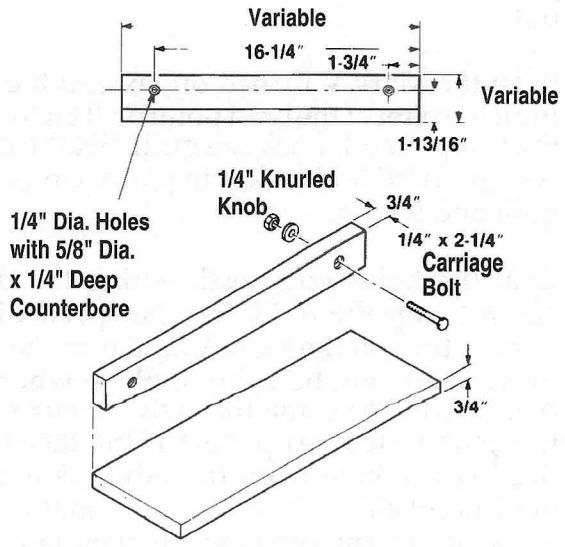


Figure C-28

3. Extend the quill so that the drill bit just touches the 'V.' With the table height crank, move the table so that the pilot of the drill bit points to the bottom of the "V." See Figure C-29. Lock the table. Place the stock in the "V" and set the depth control. Drill the hole, holding the stock down firmly. See Figure C-30.

Drilling Duplicates

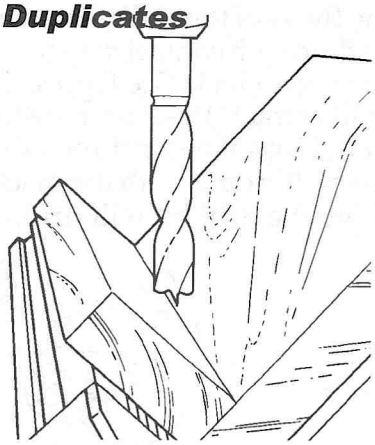


Figure C-29

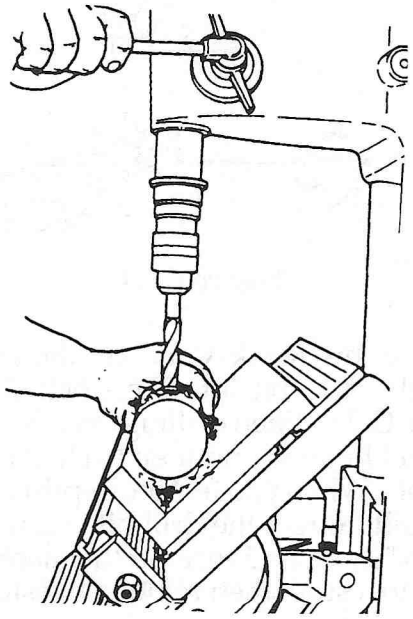


Figure C-30

WARNING

Make sure that the stock is held securely.

1. The rip fence and the miter gauge can be locked on the table in a variety of different configurations to drill duplicate holes in duplicate pieces of stock. See Figs. C-31 through C-33.

2. To set up for this, first be sure that all your stock is sawn and sanded exactly the same dimensions. Mark the position of the hole you want to drill on one piece of stock, then set the rip fence and the miter gauge to hold the stock while you drill. Tilt the table and set the miter gauge angle. Once the setup is properly adjusted, you can drill duplicate holes in all the stock.

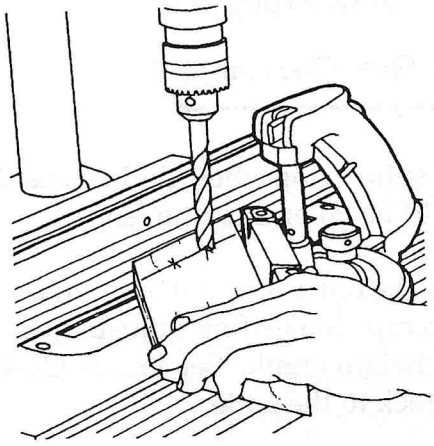


Figure C-31

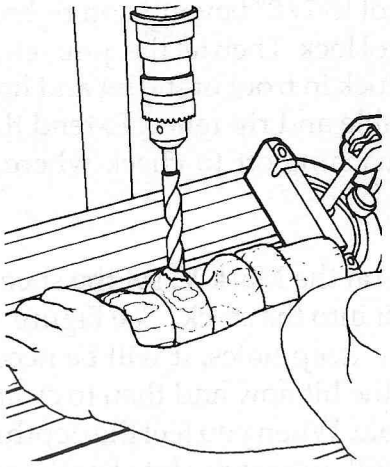


Figure C-32

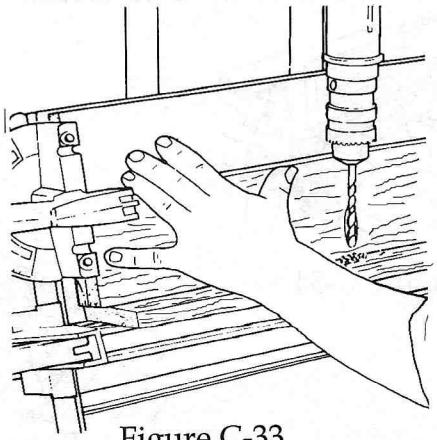


Figure C-33

Drilling Plastic

1. When drilling plastic, work at "Slow" speed. The larger the hole, the slower the speed should be. If you go too fast, the drill bit will heat up and melt the plastic.

2. Don't use brad-point drill bits; you may dull them. You can use a twist drill bit, but you risk splintering certain types of plastic. The best drill bit is a special **plastic-drilling bit.**

Drilling Metal

1. When drilling metal, clamp it to the worktable or rip fence and work at "Slow" speed. Use a sharp, high-quality **twist-bit.**

WARNING

Never drill metal freehand. Always clamp the metal to the worktable and the back-up stock, or the rip fence and the back-up stock.

2. Feed the drill bit very slowly into the metal and apply plenty of oil to the tip of the drill bit. This will keep the drill bit from dulling quickly.

3. If the drill bit catches, back it out quickly; then feed it more slowly with less pressure. If the drill bit stalls completely and the quill won't retract, quickly turn off the Mark V. Back the drill bit out of the hole, turning it counterclockwise by hand. Once the drill bit is free, turn on the machine and feed the drill bit slowly back into the metal. Once the drill bit goes through the metal, turn off the Mark V and let it come to a complete stop before you unclamp the metal.

4. After you drill metal, be sure to wipe off the Mark V. The excess oil from the operation could mix with sawdust and impede the movement of parts. Also, metal shavings could scratch the tubes or get inside the headstock.

Horizontal Boring Operations

HORIZONTAL BORING SPEED CHART

Size of Hole	Hardwood	Softwood
1/4" and less	H (1600 rpm)	I (1750 rpm)
1/4" to 1/2"	F (1300 rpm)	G (1450 rpm)
1/2" to 3/4"	D (1050 rpm)	E (1150 rpm)
3/4" to 1"	B (850 rpm)	C (950 rpm)
Over 1"	Slow (700 rpm)	A (750 rpm)

Boring metals (twist drill bits only) – Slow (700 rpm)

Safety

WARNING

Before performing horizontal boring operations:

- **Read the SAFETY section, especially for the horizontal boring mode.**
- **Complete ALL the Assembly and Alignment procedures.**
- **Set up the horizontal boring mode according to the instructions found in your Mark V Model's section.**
- **Remove the key from the chuck.**
- **Secure locks.**

Horizontal Boring Speeds

Before you begin any horizontal boring operation, know the correct speed at which to set the speed dial. The correct speed is determined by the operation and the type of material you're boring. To determine the right speed for the job, refer to the Horizontal Boring Speed Chart.

General Boring

There are two basic types of holes: holes that you bore through the stock, and holes that only go part way through the stock.

Boring Through

1. Mount the rip fence on the table to use as a backstop. (If there's no room for the rip fence, use the miter gauge.)

2. Clamp a scrap of wood on the fence to keep the bit from boring into the fence and the stock from splintering where the bit exits. This scrap should be taller than the fence.

3. Mark the holes on the stock, and lay it against the scrap. Make fine adjustments with the table height crank. See Figure C-34. Clamp the stock to the table.

4. Extend the quill so that the cutting flutes of the bit touch the scrap wood. Set the depth control to 1/8" beyond and tighten the depth control lock. Then let the quill retract. Position the stock in front of the bit and hold it against the table and rip fence. Extend the quill with the machine off to check where the bit will drill.

5. Turn on the Mark V, set the speed, and feed the bit into the stock. See Figure C-35. When boring deep holes, it will be necessary to retract the bit now and then to clear chips from the hole. When you feel the depth control stop the quill, retract the bit. Set the speed dial to "Slow" and turn off the machine. Let it come to a stop, then remove the stock.

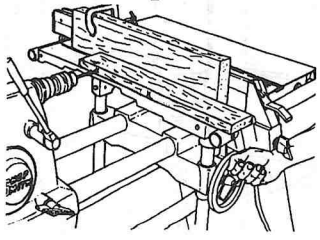


Figure C-34

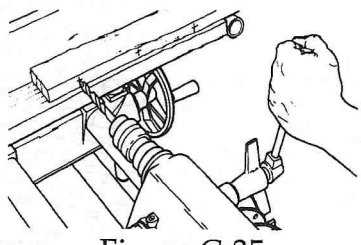


Figure C-35

Boring Part Way

1. This operation is similar to boring through, except you should extend the quill until the cutting flutes of the bit just touch the stock. Then set the depth control and lock it. The depth control will stop the quill when the bit reaches the proper depth.

2. All the holes you bore at any one depth control setting will be exactly the same depth. When you need to bore a number of holes all at the same height, such as when doweling stock edge-to-edge, hold the stock down with equal pressure at each hole.

Avoiding Tear-Out

1. Prevent rough, splintery edges where the drill exits the stock— by moving the scrap block every time you drill a new hole- this way there's always a firm surface to back up the stock. Or, if you're using brad-point bits, you can use the depth control to avoid tear-out.

2. With the Mark V turned off, extend the quill until the pilot of the brad point bit touches the scrap wood. Lock the quill. Set the depth control to "O" and lock it in place. Unlock the quill and let it retract.

3. Bore the holes you need, letting the depth control stop the quill. Set the speed dial to "Slow", turn off the Mark V and turn the stock over. There will be a tiny pinhole where the pilot started to come through the stock. Use this pinhole to line up the bit, then finish boring the hole from the other side. Since brad-point bits have spurs that cut the wood grain smoothly when they enter the wood, there will be no tear-out on either side of the stock.

Boring End Grain

1. Use the miter gauge to align the stock with the bit and adjust the safety grip to the thickness of the stock. If the stock is less than 30" long, mount the rip fence on either the worktable or extension table and use it as a backstop. If the stock is more than 30" long and you have to work without a backstop, clamp the stock to the table to keep it from slipping. Adjust the table height and depth control as desired. See Figure C-36.

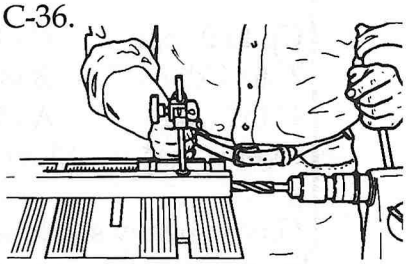


Figure C-36

2. Set the speed dial to "Slow" and begin boring. As you feed the quill, don't be alarmed if it takes more pressure than usual. End grain is hard to cut.

Boring at an Angle

1. Mount the rip fence on the table to use as a backstop. Tilt the table toward the headstock and clamp the stock to the table. See Figure C-37. If the angle is acute and you're boring through the stock, place scrap wood on the table and the rip fence.

2. You can also use the miter gauge as a backstop. Be sure to clamp the stock to the table. Otherwise the bit will push the stock out of alignment. See Figure C-38.

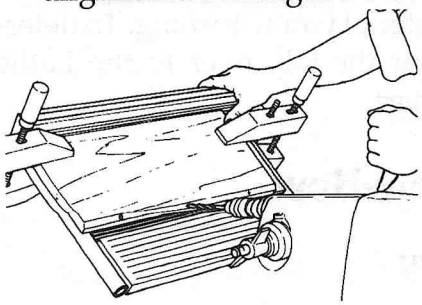


Figure C-37

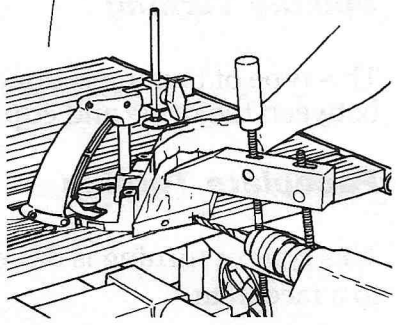


Figure C-38

Lathe Turning Operations

LATHE TURNING SPEED CHART

Size of Stock	Rounding	Shaping	Sanding
Up to 2" dia	C (950 rpm)	F (1300 rpm)	K (2050 rpm)
2" to 4"dia	B (850 rpm)	E (1150 rpm)	J (1900 rpm)
4" to 6"dia	A (750 rpm)	D (1050 rpm)	H (1600 rpm)
Over 6"dia*	Slow (750 rpm)	A (750 rpm)	B (850 rpm)

* Large heavy stock requires slower speeds.

Safety

WARNING

Before performing lathe turning operations:

- **Read the SAFETY section, especially for the lathe mode.**
- **Complete ALL the Assembly and Alignment procedures.**
- **Secure locks.**

Lathe Turning Speeds

NOTE

The speeds in the speed chart are only suggested speeds.

Before you begin any lathe turning operation, know the correct speed at which to set the speed dial. The speed is determined by the operation and the type of material you're turning. To determine the speed for the job, refer to the Lathe Turning Speed Chart.

Turning Know-How

Spindle Turning

This type of turning is done with stock mounted between the drive and cup centers.

Faceplate Turning

This type of turning is done with stock mounted to a faceplate.

Scraping

This technique uses the cutting edge of the tool to scrape the stock. See Figure C-39. Position the tool rest just below the axis of rotation of the stock so the chisel cuts on center. Slowly feed the chisel toward the stock. The chisel should point directly at the center of the stock.

Shearing

This technique uses the cutting edge of the tool to pare away the stock. See Figure C-40. Position the tool rest 1/4"-1/2" below the top of the stock, and feed the chisel at an angle.

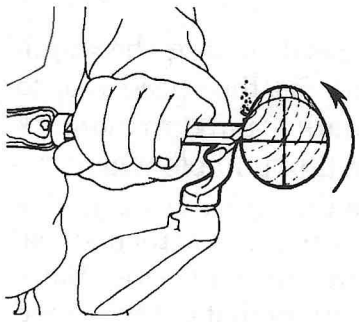


Figure C-39

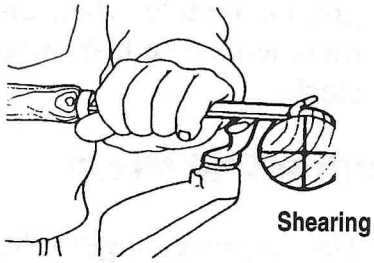


Figure C-40

Lathe Tools

Gouges round the stock and make coves; roundnose chisels make coves; skew chisels make beads and cut cylinders; parting tools size and part.

Balance

1. This is extremely important when turning glued-up stock, long stock and stock more than 3" in diameter. Check the balance of your spindle and faceplate stock after you've marked the centers.

2. To do this, drive a standard 8-penny nail straight into each center. Use suitable string to hang the stock in a level position from the front bench tube of the Mark V or a saw horse. The ends of the string should be looped around the nails. See Figure C-41. Gravity will pull the heavy side down. Use a jointer, bandsaw or hand plane to remove no more than 1/32" at a time from the heavy side until the stock remains stationary when rotated to three positions 90 degrees apart.

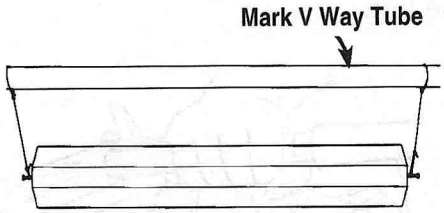


Figure C-41

Spindle Turning

Follow these steps for spindle turning operations:

1. **Mounting** - This is an extremely important operation.

NOTE

Improperly mounted stock is dangerous and difficult to turn.

WARNING

- **Make sure the workpiece is not cracked or split.**
- **When turning glued up stock, make sure the glue joints are strong. Glue the stock and leave it clamped for at least 24 hours prior to turning.**
- **Cut stock that's more than 3" square into an octagon. This removes excess stock which makes turning safer and easier.**

a. With a straightedge, draw two diagonal lines corner-to-corner on each end of the stock to find the center.

b. Position the points of the drive and cup centers at the center marks and hit the centers sharply with a nylon or rawhide mallet. Do not use a metal hammer.

-- If you're using a live center, avoid damaging the live center bearing by using the cup center for this procedure. The hole left by the cup center will accommodate the live center.

-- To help seat the centers when working with hardwood, drill 1/8" dia. by 1/2" deep holes in both ends of the stock, and/or saw diagonal kerfs 1/8" deep.

-- When properly seated, the drive center will leave a hole and four slots and the cup center will leave a hole and a small circle 1/16"-1/8" deep. See Figure C-42.

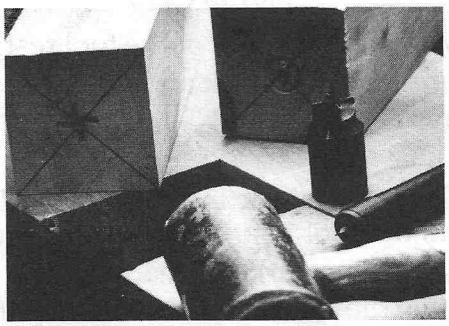


Figure C-42

WARNING

The spurs of the drive center and the cup of the cup center must penetrate at least 1/16" into the stock. Do not use a drive center, cup center or live center if the point is damaged. The stock could be thrown from the lathe.

c. Cut stock larger than 3" square into an octagon using the bandsaw.

d. Mount the drive center on the main spindle and the cup center in the tailstock. Mount the tailstock in the base mount. Position the headstock so that the centers are about 1" farther apart than the length of the stock, then lock the headstock.

WARNING

Wax or soap the end of the stock that mounts to the cup center. This lubrication helps keep the center from wearing into the stock and causing the stock to loosen on the lathe.

e. Hold the end of the stock against the cup center, then extend the quill and mount the other end on the drive center. Press hard against the quill feed lever, then lock the quill. See Figure C-43.

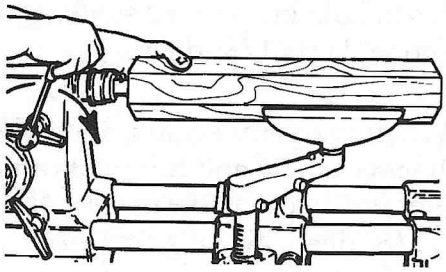


Figure C-43

f. Adjust the height of the tool rest and align it parallel to the stock and not more than 1/4" away.

g. Turn the stock by hand to make sure it clears the tool rest. Make sure speed is set at "Slow". Then turn on the machine briefly to test that the stock rotates smoothly. If the stock vibrates significantly, the center holes must be relocated and/or the stock balanced.

2. **Rounding** -- This turns the stock down to a rough cylinder.

WARNING

During turning, periodically turn off the Mark V and readjust the tool rest to maintain a 1/4" distance between the tool rest and the stock. Also, adjust the quill to keep the stock secure between the centers.

a. Lay a gouge on the right end of the tool rest with the cup facing up and tilted slightly toward the left. Angle the handle slightly toward the right end of the tool rest so that the bevel is almost parallel to the stock.

b. Gently feed the cutting edge toward the stock until the tip just touches the stock. Then draw it slowly and steadily along the tool rest, removing a little bit of stock.

c. Turn the gouge so the cup still faces up, but slightly toward the right. Angle the handle to the left.

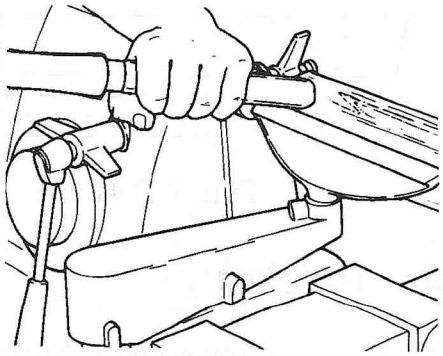


Figure C-44

d. Feed the gouge into the stock and draw it back along the tool rest. Repeat this procedure until the stock is completely round. See Figure C-44. Turn off the Mark V.

3. **Sizing** -- this marks the approximate diameters of the shapes.

a. Use a pencil to mark the beads and coves.

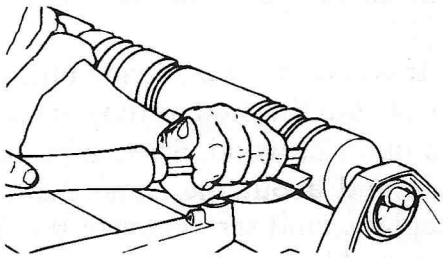


Figure C-45

b. Turn on the machine and increase the speed slightly. With a parting tool, cut grooves in the stock. See Figure C-45. Use calipers to check the diameters.

4. **Shaping** -- This forms the beads and coves in your design. Turn the large diameters first to avoid weakening the stock for the rest of the turning.

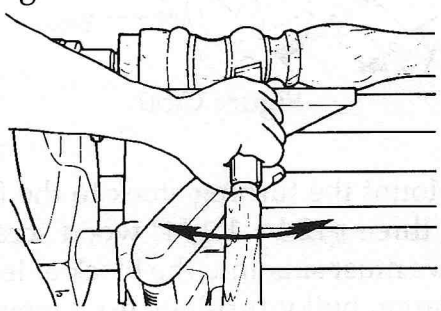


Figure C-46

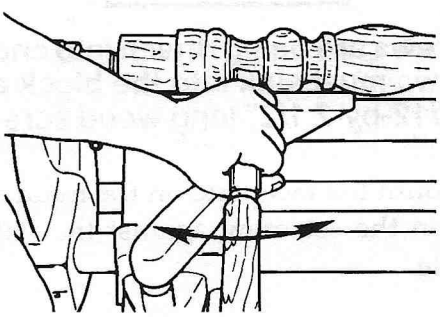


Figure C-47

a. Cut the beads first. Feed the edge of a skew chisel slowly into the stock, then move the handle of the skew from side to side as needed to shape the beads. See Figure C-46.

b. Cut the coves. Feed a gouge slowly into the stock, then move the handle of the tool from side to side to shape the cove. See Figure C-47.

5. **Sanding** -- It's much easier to sand a turning on the lathe than it is to remove it and hand sand it.

WARNING

Always remove the tool rest before sanding the turning on the lathe.

a. Remove the tool rest and increase the speed slightly.

b. Start with medium sandpaper. Double the sandpaper over several times to protect your fingers. Begin to sand by holding the sandpaper lightly against the stock. Work your way through progressively finer grits. See Figure C-48.

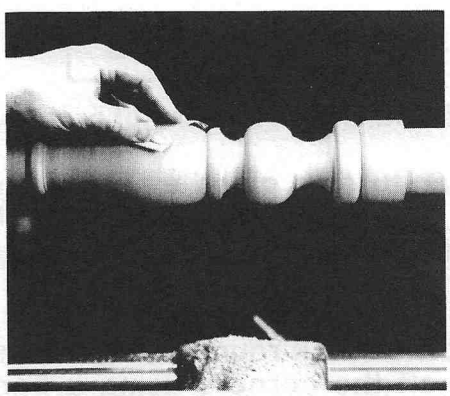


Figure C-48

c. Sanding causes feathers on the stock. To remove these: Wet the stock with a damp rag, wait a few minutes for the water to raise the grain and evaporate, then final sand with a very fine grit. Or, dismount the spindle, turn it end for end, remount it, then final sand.

6. **Parting** -- Use a parting tool, turned on its edge to scrape away stock from the ends of the spindle. See Figure C-49. Always leave 1/8 the thickness of the diameter. For example: if the diameter is 2", leave 1/4"; if 3", leave 3/8"; if 4", leave 1/2". Remove the spindle from the lathe and cut off the waste stock.

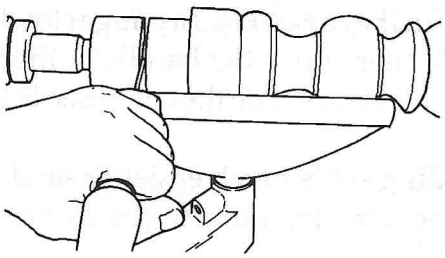


Figure C-49

WARNING

DO NOT part the turning completely or turn it down to such a small diameter that it snaps on the lathe.

Faceplate Turning

1. **Mounting** -- This is an extremely important operation. Improperly mounted stock is dangerous and difficult to turn.

WARNING

- **Make sure the stock is not cracked or split.**
- **When turning glued up stock, make sure the glue joints are strong. Glue the stock and leave it clamped for at least 24 hours prior to turning.**
- **Cut the stock round using a bandsaw, or cut off the corners using a bandsaw or table saw. This removes excess stock which makes turning safer and easier.**
- **Large, heavy stock should be turned only at very low speeds, AND with the extra support of the tailstock, as seen in Figure C-49a.**

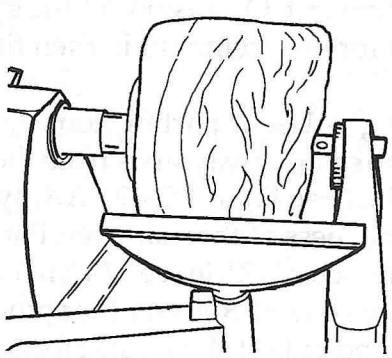


Figure C-49a

a. Find the center of the stock by drawing diagonal lines from corner to corner. Then use a compass to mark the outside diameter of your turning. Cut the stock round.

-- If you don't want screw holes in the bottom of your finished turning, mount the stock to a block of wood. Select a block at least 1" thick and about the same diameter as the faceplate. Find the center of this block, then glue the block to the stock, center to center. Put a piece of newspaper in between the block and the stock when you glue them up. Leave clamped at least 24 hours. See Figure C-50.

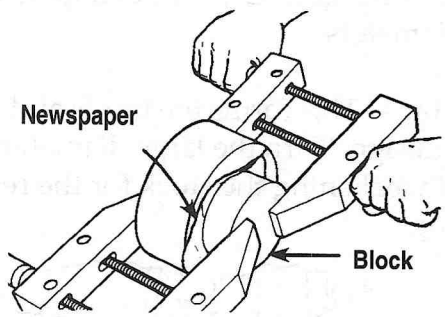


Figure C-50

b. Mount the turning stock to the faceplate with three #12-by-1 1/4" wood screws. The screws must sink into the block at least 3/4". For large, bulky turnings use longer screws and a thicker block.

WARNING

If the screws are being driven into end grain, the screws must sink into the block at least 2". Use #12-by-2 1/2" long wood screws.

c. Mount the faceplate on the main spindle. Tighten the setscrew against the flat of the spindle.

d. Turn the outside first. Adjust the height of the tool rest and align it parallel to the stock and not more than 1/4" away. When turning heavy stock mount the tool rest in the center position. Support the stock with both the main spindle and the tailstock, as shown in Figure C-49a.

e. Turn the stock by hand to make sure it clears the tool rest. Then turn on the machine briefly to test that the stock rotates smoothly, with no excessive vibration.

2. Rounding -- Round the outside, using a roundnose or gouge, just as you would for spindle rounding. See Figure C-51. If the wood grain is perpendicular to the axis of rotation, do not shear.

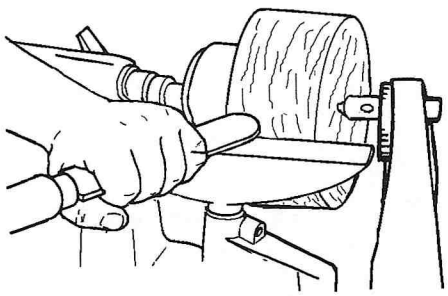


Figure C-51

WARNING

During turning, periodically turn off the Mark V and readjust the tool rest to maintain a 1/4" distance between the tool rest and the stock.

3. Shaping the outside -- Make the beads and coves in the same manner as for spindle shaping. See Figure C-52. If the wood grain is perpendicular to the axis of rotation, do not shear.

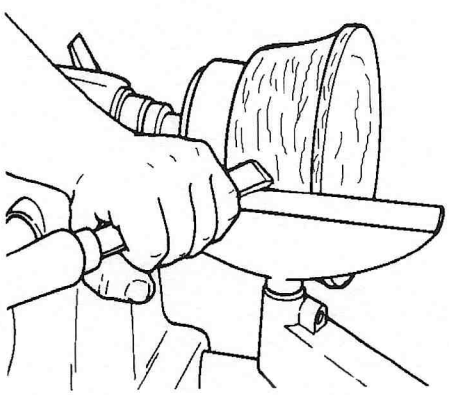


Figure C-52

4. Shaping the inside -- Position the tool rest not more than 1/4" from the stock and adjust the height so that it's about 1/4" below the center of the stock.

a. Scraping is one way to shape the inside. Turn on the machine, set the speed, and feed a roundnose chisel against the downward side of the stock. See Figure C-53. As you work, periodically check the inside diameter with inside calipers.

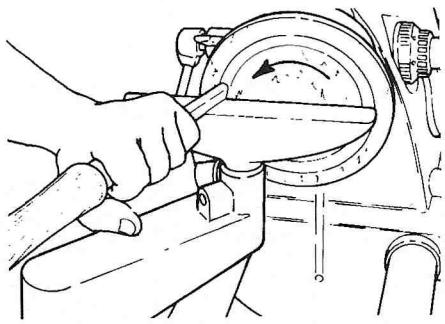


Figure C-53

5. Sanding -- Sand the turning as you would a spindle. (Refer to "Spindle Turning" Step 5.) Remove the tool rest.

a. Remove the feathers either by wetting the wood or by dismounting the faceplate from the main spindle and remounting it on the upper auxiliary spindle.

6. Parting -- Dismount the faceplate from the main spindle and unscrew the faceplate. If a block was glued to the stock, clamp the block in a vise and place a chisel between the block and the turning. Hit the chisel with a mallet, driving it between the block and the turning. Sand the remains of the newspaper and any excess glue off the turning.

NOTES

Maintenance and Troubleshooting

This section of the Mark V Owner's Manual contains maintenance information and a troubleshooting guide. It should cover topics and answer most questions you may have for normal maintenance and problem solving. Follow the maintenance schedule below for as long as you own your Mark V. Regular maintenance is essential for any tool and machine to perform at its best.

The maintenance intervals shown here are based on normal operation. If you work the machine unusually hard, you'll need to maintain it more often.

To estimate "running time", use this rule of thumb: The average woodworker will use his power tools only 20% of the total time spent in the shop–at the most. If you work in your shop for 25 hours, you've probably logged 4-6 hours on your Mark V. Average the time you spend in your shop to determine the proper maintenance interval for your machine. But the 50-hour procedure should be performed at least once a year.

MAINTENANCE SCHEDULE

As needed	❧ Clean the saw guards and sanding disc. Refer to **Maintaining Accessories.** ❧ Sharpen saw blades, drill bits and lathe chisels.
Every 5 hours of running time	❧ Clean the Mark V. Refer to **Cleaning.** ❧ Wax the Mark V. Refer to **Waxing.**
Every 10 hours of running time	❧ Repeat the preceding steps. ❧ Lubricate the drive shaft and idler shaft. ❧ Check the action on the anti-kickback system and the lower guard, wax the splitter on the lower guard and lubricate the chuck. Refer to **Maintaining Accessories.** ❧ Check the alignment and adjustment of the headrest and carriage locks, worktable stops, table tilt indicator, miter gauge slots, miter gauge, rip fence, extension table and lathe centers. Refer to the **Alignment** instructions for your Mark V model.
Every 25 hours of running time, or once a year (if not used)	❧ Lubricate the sheaves. Refer to **Lubricating.**
Every 50 hours of running time or once a year (if not used)	❧ Repeat the preceding steps. ❧ Lubricate the headstock lock. Refer to **Lubricating.**

Preparation

WARNING

Turn off and unplug the Mark V BEFORE you begin any maintenance procedure.

Before you begin a maintenance procedure, remove the blades, bits or any other accessories that are mounted on the machine. Set the machine in the horizontal position and secure the headstock lock. Finally, move the worktable and carriage as far to the right as it will go.

Cleaning

As you work, sawdust will accumulate on and in your Mark V. This residue can affect its performance. To prevent problems, clean your Mark V thoroughly inside and out once every 5 hours of running time or monthly.

Blowing Out the Headstock

1. With a medium Phillips screwdriver, remove the two screws that hold the belt cover. Then slide the belt cover back along the way tubes toward the left. Open the access hole by removing the bottom screw and turning the nameplate 180°.

2. Working through the openings, completely blow out all the sawdust from the inside of the headstock. Use an air compressor. Replace the screw.

Cleaning the Table

3. Clean the miter gauge slots with a clean rag and mineral spirits. With a 5/32" Allen wrench, remove the two screws that secure the table insert. Using a small stick, scrape out any sawdust that has accumulated under the insert.

Cleaning the Racks

4. With a small, stiff brush, reach in through the nameplate opening and brush off the teeth on the portion of the quill inside the headstock, as demonstrated in Figure D-1. Then extend the quill out from the headstock as far as it will go and brush off the outside teeth.

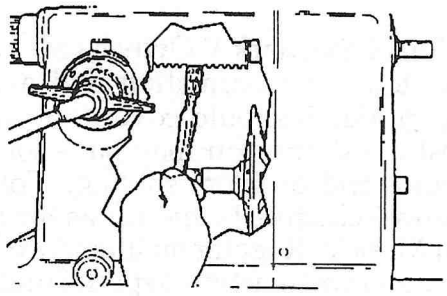


Figure D-1

5. To clean the table rack, remove the table from the carriage. Brush the sawdust from between the teeth on the table support tubes and the pinions in the carriage.

Brushing Off

6. Give the entire machine a good going over with a soft brush to remove any remaining sawdust or dirt. If you find any grease or grime on the way tubes, or any other part, clean it off with mineral spirits.

7. When your Mark V is clean, wax and buff all parts (refer to Waxing), replace the table in the carriage, reinstall the table insert and belt cover, and reposition the nameplate.

Lubricating

All the bearings are shielded and permanently lubricated so they do not need lubrication. However, there are several other parts that require lubrication.

8. To lubricate your Mark V, first clean the machine thoroughly, as described in Cleaning. But don't reinstall the belt cover or nameplate. Then follow these procedures:

Lubricating the Sheaves

9. Every ten hours of running time or once a month if not is use, lubricate the floating sheaves (pulleys) with a good 10w30 non-detergent motor oil. Be sure to oil both upper and lower sheaves. Apply the oil sparingly (2-5 drops only) as too much will mix with a sawdust and cause parts to stick.

NOTE

Do not use penetrating oils or oils in aerosol cans. They tend to gum up at low temperatures.

10. To lubricate the sheaves, first plug in the Mark V, turn it on and run the speed dial up to the highest speed. Then turn the machine off and unplug it.

11. Oil the upper control sheave first. While looking through the nameplate opening, turn the main spindle by hand until you locate the hole in the sheave. With the oil can tube inside the headstock apply 2-5 drops of oil in the hole, as seen in Figure D-2.

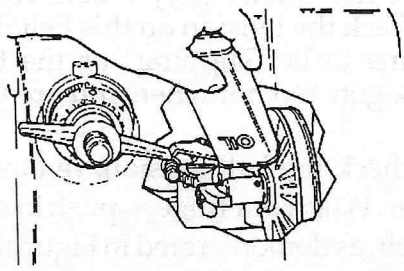


Figure D-2

12. To oil the lower floating sheaves, rotate the main spindle by hand until you find the hole in its sleeve. This hole may be difficult to find because of the spring that fits over the sleeve. When you find the hole, spread the coils of the spring over the hole with a large blade screwdriver. Then apply 2-5 drops of oil in the hole, as shown in Figure D-3. (You can also accomplish this by oiling the shaft directly. With a screwdriver push the spring back towards the sheave and apply 2 - 5 drops of oil.

13. When you've lubricated both sheaves, replace the nameplate and the belt cover. Plug in the Mark V and turn it on. Run the machine completely through the speed range several times to help spread the oil out over the shaft and to distribute grease throughout bearings.

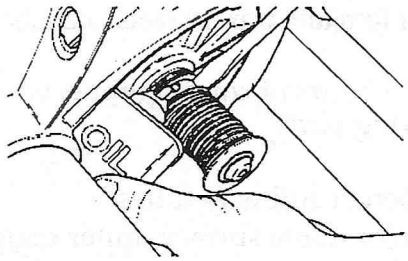


Figure D-3

Lubricating the Locks

Every 50 hours of running time or at least once a year, apply a dry lube product to the threads of the headstock lock.

14. First inspect the threaded rods of the headstock lock (found inside the headstock), the carriage lock (underneath the carriage), and the rip fence lock rod (inside the rip fence). Brush off or wipe off any foreign materials.

15. To lubricate the **headstock lock**, loosen the lock as far as possible. Then reach inside the nameplate opening and apply a small amount of powdered graphite to the points where the threaded rod screws into the wedge locks, as illustrated in Figure D-4. Replace the nameplate and secure the headstock lock.

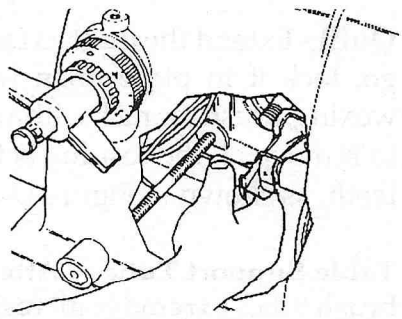


Figure D-4

Waxing

CAUTION

Use paste floor or furniture wax. Do not use car wax or spray furniture polish. The Mark V needs wax for both protection and lubrication. Car wax offers good protection for metal, but it is extremely hard and has little value as a lubricant. Furniture polish isn't hard enough. Paste floor or furniture wax protects and lubricates.

Every 5 hours of running time, wax and buff the following parts:

- Bench and way tubes
- Worktable surface, miter gauge slots, table support tubes, and the table tubes
- Quill
- Rip fence (both sides)
- Miter gauge bar
- Extension table surface, support tubes, and table tubes
- Mounting holes in the power mount, base mount and carriage.

16. Apply the wax sparingly and buff it thoroughly. If you apply too much wax or don't buff it out, the wax will mix with sawdust, impede moving parts, and leave residue on the wood.

17. Some of the parts that need waxing require special care:

    a. **Way Tubes** - Don't slide the headstock and/or carriage over new wax before you buff it out. Otherwise, wax may accumulate inside the headstock or carriage and impede movement.

    b. **Quill** - Extend the quill as far as it will go, lock it in place, then wax. After waxing, brush the rack with a stiff brush to remove all the residue between the teeth, as shown in Figure D-7.

    c. **Table Support Tubes** - After waxing, brush tubes to remove all residue from the racks.

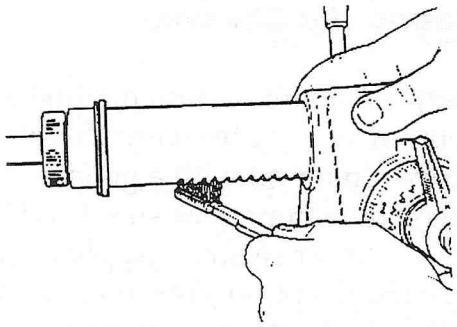


Figure D-7

    d. **Mounting Holes** - Wrap a rag around a dowel to apply wax inside these holes. Use the same technique to buff it out.

Checking Belt Tension

NOTE

If the poly V-belt seems tight but it still slips, DO NOT increase the belt tension-this will just stretch the belt out of shape. Instead, apply a little "belt dressing" to the inside of the belt to increase its traction.

Every 50 hours of running time or once a year, check the tension of the poly V-belt. You may also need to check the tension on this belt if the drive train seems to be "slipping" or the top of the headstock gets too hot when you are working.

18. To check the belt tension, remove the belt cover. With your fingers, push in on the poly V-belt, as demonstrated in Figure D-8. If you can push the belt in more than 1/8" when applying pressure, the belt needs to be tensioned.

Check Tension

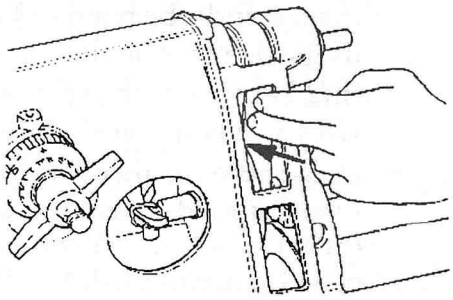


Figure D-8

19. To adjust the tension, loosen the bolt that holds the idler shaft eccentric bushing in the headstock casting, as shown in Figure D-9. Insert a blade screwdriver in the slot of the eccentric bushing and turn the bushing clockwise in the casting until it stops, as seen in Figure D-10. With your finger, test the tension to see that you have taken the "slack" out of the belt. Retighten the bolt. **Do not overtighten.**

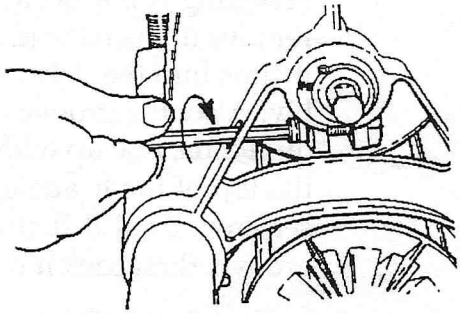


Figure D-9

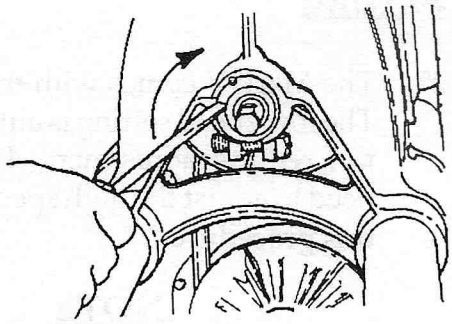


Figure D-10

Maintaining Accessories

In addition to maintaining the basic machine and the parts you use in more than one mode (such as the miter gauge or rip fence), you must maintain the individual accessories for each separate mode–saw guards, sanding discs, drill bits, etc...

Saw Guard System

20. As needed, brush off and blow away the sawdust that accumulates in the saw guards. The upper saw guard has a plastic insert toward the front, where most of the sawdust builds up. This can easily be removed, cleaned, and reinstalled. Dissolve the impacted sawdust with mineral spirits.

CAUTION

DO NOT use lacquer thinner to clean the saw guards. This solvent dissolves the plastic parts, distorting them or making them cloudy.

21. Every 10 hours of running time, wax and buff the riving knife on the upper saw guard. Check that the anti-kickback system and the spring-loaded lower saw guard operate smoothly. If either of these seems stiff, apply powdered graphite or a dry lube product to the rods. Do not use oil on these parts.

Sanding Disc

22. As you work, sawdust, wood oils, glues and other materials will "load up" on sandpaper. As needed, hold an abrasive cleaner against the disc while the Mark V is running at low speed. The soft rubber reaches in between the grit and digs out the impacted materials without stripping the abrasive off the sandpaper.

Drill Chuck

23. Every 10 hours of running time, apply a small amount of powdered graphite or a dry lube product to the inside of the drill chuck to keep it operating smoothly.

Saw Blades, Lathe Chisels and Drill Bits

24. These cutters will become dull with use. Sharpen as needed. A sharp cutter performs better and is safer.

Storing

25. In normal use, regular cleaning, lubrication, and waxing will prevent the ferrous parts of the Mark V from rusting. However, if the machine is to be stored for an extended period or under unusually humid or corrosive conditions, spray the way tubes, saw

blades, drill chuck and bits, and any other ferrous parts and accessories with a rust-inhibiting light oil. Remove this oil with mineral spirits and re-wax the Mark V before using it again.

Tensioning the Quill Feed

26. The quill feed should be tensioned so that the quill retracts easily and smoothly, but not so tight that the spring binds when the quill is fully extended. If you should need to adjust or restore the tension on the quill, follow this procedure:

WARNING

• Turn off and unplug the Mark V before performing the following procedures.

• Do not prematurely release control of the quill feed lever during removal and/or installation of the quill. Attached to the quill is a tight, "loaded" spring. If the quill feed lever is released before the spring has "unloaded" its tension, the quill could cause injury.

a. Remove the quill. On top of the headstock, between the quill lock and quill feed stop, there is a setscrew that keeps the quill from advancing all the way out of the headstock. If your machine has never been worked on before, this screw is covered with gray lead. Dig out the lead system with a pen knife, and back out the setscrew 2 full turns.

b. Advance the quill until you feel the rack disengage from the quill feed pinion. Do not let go of the quill feed lever. Continue to hold onto the lever and pull the quill assembly out of the headstock. When you have removed the quill assembly, set the quill feed stop at 4-1/4". Tighten the stop lock.

CAUTION

Do not tighten the quill lock. This will damage parts.

c. Adjust the tension. With your hand holding the quill feed lever, release the quill feed stop lock and slowly let the lever unwind. When the tension has been relieved, rewind the lever 3 full turns clockwise (as you look at the headstock from the speed dial side). This will restore the tension to its original factory setting.

d. Install the quill assembly, by simply reversing the procedure you used to remove it. Turn the main spindle until it slips into the drive and ring assembly. Also, the groove in the top of the quill must line up with the setscrew in the top of the headstock. Tighten this setscrew until it "bottoms out" in the groove, then back it out 1/16" turn.

Adjusting the High Speed Setting

27. The Mark V comes with the speeds preset. The low speed setting is automatic and does not require adjustment. However, if you need to adjust the high speed setting, follow this procedure:

NOTE

A tachometer (available at a tool rental store) is helpful to make the high speed adjustment.

WARNING

Since some steps of this procedure are performed with the Mark V plugged in and/or running, keep your hands and other parts of your body away from moving and/or electrified parts of the machine. Also, do not stand in-line with moving parts. Remove all accessories and attachments, including the saw blade.

a. Remove the belt cover. Slide the headstock and carriage to the right along the way tubes as far as they will go. Secure the headstock and carriage locks, then remove the two screws hold-

ing the belt cover to the headstock. Slide the belt cover off the headstock and to the left along the way tubes, out of the way.

b. Plug in and turn on the machine. Turn the speed dial toward "Fast" until the tachometer reaches 5,200 RPM or until the top of the drive belt is 1/8" - 1/16" below the outside diameter of the lower sheaves, or the high speed stop is engaged. Use a grease pencil to mark the location of the access hole in the speed control handle on the headstock casting. Then turn the speed control handle part of a revolution toward "Slow" until the access hole in the side of the speed control handle is facing up.

c. Turn off and unplug the Mark V.

d. Remove the speed control handle. With the access hole in the side of the speed control handle facing up, insert a 3/32" Allen wrench or a slotted screwdriver in the hole and loosen the setscrew holding the handle to the worm control shaft, as seen in Figure D-11.

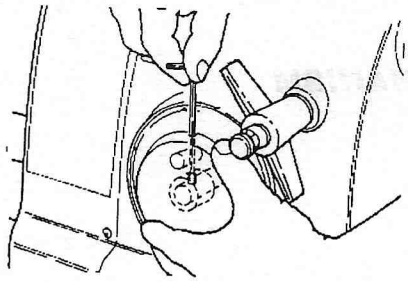


Figure D-11

e. Loosen the jam nut. Hold the setscrew with a 1/8" Allen wrench and loosen the jam nut with a 7/16" open end wrench.

f. Plug in and turn on the Mark V. Turn the worm control shaft by hand (or with padded pliers) until the recess in the shaft lines up with the mark on the headstock.

g. Adjust the setscrew. With the jam nut loose, turn the setscrew until it contacts the control arm quadrant.

h. Turn off and unplug the Mark V.

i. Lock the jam nut. Make sure that the control arm quadrant is engaged against the setscrew and the drive belt is 1/8" - 1/16" below the outside diameter of the lower sheaves. Then hold the setscrew with a 1/8" Allen wrench and tighten the jam nut with a 7/16" open end wrench.

j. Install the speed control handle. If after the setscrew was adjusted, the recess in the shaft is not facing up, pull the motor sheaves apart and push the drive belt up inside the headstock. This will loosen the drive belt in the upper sheaves. This setting will be less than "Fast" and the speed dial needs to be adjusted accordingly. Replace the control handle on the worm control shaft so that the setscrew lines up with the recess in the shaft. Then tighten the setscrew.

k. Mount the sanding disc on the main spindle. Turn the disc by hand and gently turn the speed dial from "Fast" to "Slow." Remove the sanding disc.

l. Plug in and turn on the Mark V. Turn the speed control handle until the access hole returns to the position marked at "Fast." If the speed control handle comes up against the high speed stop before the access hole reaches the mark, the high speed stop is set at too low of a speed. If the access hole continues past the mark before coming up against the high speed stop, the high speed stop is set at too high of a speed.

m. Repeat Steps 3 through 12 until the high speed stop is set at 5,200 RPM. Run the machine through the speed

ranges. Check to see that the speed dial stops at "Slow" and "Fast."

CAUTION

The Mark V headstock runs at a maximum speed of 5,200 RPM. Do not exceed 5,200 RPM. Reset speed dial.

n. Install the belt cover.

Cleaning the Speed Changer

28. Fine sawdust can accumulate on various parts of the speed changing mechanism and interfere with its operation, even if you blow out the headstock regularly. If the speed dial becomes hard to turn and lubricating the motor shaft and idler shaft does not relieve the problem, clean the speed changing mechanism according to the following procedure. See Figure D-13 and the Parts List to identify parts.

a. Set the speed dial to "Fast," with the Mark V running. Observe where the opening is for access to the setscrew on the speed control handle. This opening must be facing straight up. Turn the speed dial until this position is achieved. Note which letter is closest to the arrow on the headstock.

NOTE

When the speed control handle is reinstalled, this same position must be located so that the speed dial is in calibration with the speed control handle.

WARNING

Turn off and unplug the Mark V.

b. Detach the speed changer from the sheaves. Open the access hole by removing the bottom screw and turning the nameplate 180°. Look inside the headstock through the nameplate opening. On the end of the upper floating sheave is a retaining loop hooked over a leaf spring. The leaf spring is attached to the quadrant assembly. Depress the leaf spring that is attached to the quadrant assembly. Depress the leaf spring and swing the retaining loop toward you, off the spring.

SPEED CHANGING MECHANISM

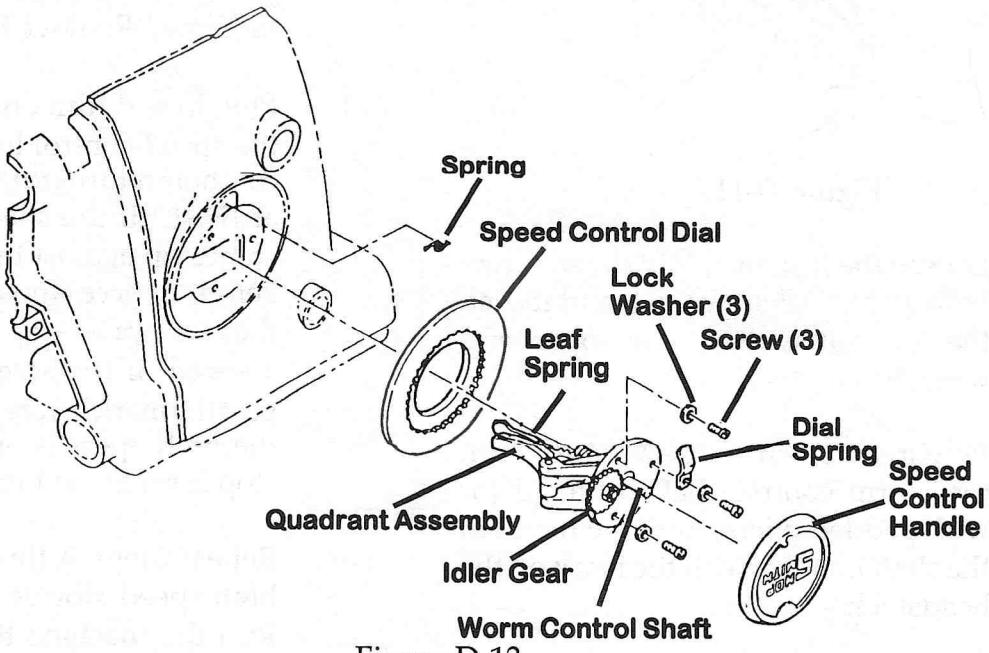


Figure D-13

c. Remove the speed control handle. With the access hole in the side of the speed control handle facing up, insert a 3/32" Allen wrench in the hole and loosen the setscrew holding the handle to the worn control shaft, as shown in Figure D-14. Pull the handle free of the shaft.

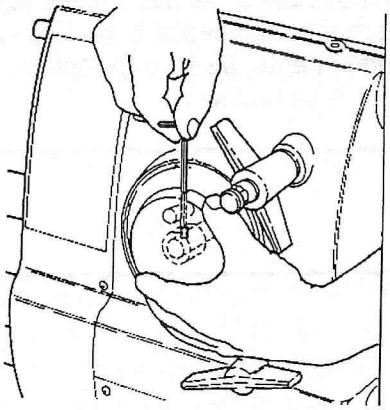


Figure D-14

d. Remove the speed dial and speed changer. Remove the three screws and washers that hold the speed dial and speed changer in the headstock. The screw toward the right also holds a dial spring on the outside and a nylon clip inside the headstock. To keep from losing the clip, reach inside the headstock through the nameplate opening and hold it while loosening the screw, as demonstrated in Figure D-15. When you have removed all three screws, pull the speed dial and the speed changer out of the headstock.

NOTE

Do not remove the spring behind the dial. This spring keeps the speed dial from rattling when the machine is running.

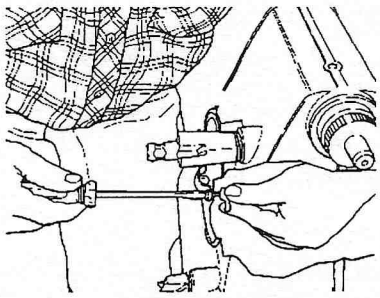


Figure D-15

e. Clean the speed changing mechanism. To clean the speed changer, thoroughly scrub the idler gear and the interlocking teeth of the speed control dial on the front of the assembly with a small, stiff brush (toothbrush) soaked in mineral spirits or turpentine. Then turn the worm control shaft until the quadrant assembly swings free of the worm control shaft. Scrub the shaft and quadrant teeth until they are free of grease and sawdust.

f. Wipe all parts dry with a clean rag. Put a tiny dab of cup grease or "furnace bearing" grease (beeswax) on the worm control shaft and rack of the quadrant assembly. Then reengage the shaft and the quadrant assembly. Turn the shaft clockwise until it stops, so parts will remain calibrated.

g. Install the speed changer and speed control dial. Install the speed control dial and speed changer, taking care not to turn the worm control shaft. Fasten the speed changer in the headstock with the two screws on the left, then install the screw on the right, along with the dial spring on the outside. The dial spring helps keep the speed control handle from turning when the machine is running. The end of the spring should rest between two small bumps on the speed changer.

h. Hook the retaining loop on the end of the sheave over the quadrant assembly and replace the nameplate.

i. Install the speed control handle on the worm control shaft so that the setscrew lines up with the depression in the shaft, then tighten the setscrew.

j. Mount the sanding disc. Spin the disc by hand while turning the speed dial to "Slow."

k. Plug in and turn on the Mark V. Run the machine through its range. Check to see that the dial stops at "Slow" and "Fast." Additional adjustment may be necessary to calibrate the dial to the handle.

l. Replace the belt cover.

The drive hub which is installed on the intermediate shaft is used to power Major Accessories. It also serves as a heat sink, reducing temperature caused by friction in the bearing seal on the intermediate shaft.

DO NOT remove the drive hub unless you require service of internal components. If service is done on the internal components, be sure to replace the drive hub after service is completed.

NOTES

Correcting Problems with the Troubleshooting Guide

Power tool problems usually have simple solutions – under normal use, you should rarely have to service your Mark V. Most problems can be corrected by maintenance, alignment, adjustment, or a change in work habits. For instructions on maintenance, consult the Maintenance Section of this manual. To help diagnose and remedy any problem that may arise when using your Shopsmith Mark V, use this Troubleshooting Guide.

How to Use the Troubleshooting Guide–

1. Consider where the origin of the problem may be.

2. Refer to the Table of Contents below and go to the appropriate page.

3. Once you have identified the possible cause, follow the solution prescribed.

WARNING

Never operate power equipment that is not working properly. Turn off and unplug the machine before making adjustments or performing maintenance or repair procedures.

Do not attempt any repair which is designated as a "factory job."

Use only Shopsmith recommended parts and accessories on your Mark V.

Troubleshooting Table of Contents

Problem Area	Starts on Page...
Drive Train	D-12
Electrical	D-15
Speed Changer	D-16
Quill and Main Spindle	D-17
Auxiliary Spindles	D-18
Worktable and Carriage	D-19
Way Tubes and Locks	D-20
Miter Gauge	D-21
Extension Table	D-22
Saw Blades	D-23
Upper and Lower Saw Guards	D-24
Sanding Disc	D-24
Drill Chuck	D-25
Lathe Accessories	D-25
Table Sawing	D-26
Disc Sanding	D-28
Drilling and Boring	D-30
Lathe Turning	D-32

Problem	Possible Cause	Solution
***Drive Train* (Headstock)** Turn the Mark V on and nothing happens.	Machine unplugged.	Plug machine in.
	Switch defective.	Replace switch.
	Switch wires disconnected.	Check wires. If disconnected, call Factory for directions.
	Power cord defective.	Replace power cord.
	Motor defective.	Replace the motor. **Should be done by an authorized Service Dealer or Shopsmith Factory Repair.**
Motor only hums.	Motor bearings worn and binding.	Replace the motor. **Should be done by an authorized Service Dealer or Shopsmith Factory Repair.**
	Start switch in motor defective.	Replace the motor. **Should be done by an authorized Service Dealer or Shopsmith Factory Repair.**
Mark V starts up slowly.	Shop temperature below 55°.	Warm up shop.
	Starting windings in motor defective.	Replace the motor. **Should be done by an authorized Service Dealer or Shopsmith Factory Repair.**
	Motor bearings worn and binding.	Replace the motor. **Should be done by an authorized Service Dealer or Shopsmith Factory Repair.**
Mark V loses power or stalls at all speeds.	Poly V-belt loose.	Tension Poly V-belt and/or apply belt dressing sparingly.
	Poly V-belt worn.	Replace Poly V-belt.
	Drive belt worn.	Replace drive belt.

Problem	Possible Cause	Solution
Mark V loses power or stalls at all speeds (cont.').	Drive belt in a bind.	With unit turned off and unplugged, turn the speed dial slowly to high. This will separate the sheaves, allowing belt to become free.
	Work being forced.	Take your time; let the machine do the work.
	Blade or cutters dull.	Touch up or sharpen blade or cutters.
	Drive and ring assembly broken.	Replace drive and ring assembly.
	Rip fence or miter gauge misaligned, blade or disc binds.	Align rip fence or miter gauge.
	Extension cord too long or wire gauge too small.	Replace with shorter, fatter cord. **See Electrical Requirements.**
	Motor defective.	Replace the motor. **Should be done by an authorized Service Dealer or Shopsmith Factory Repair.**
Motor loses power at high speeds.	Sheaves sticking on shafts.	Lubricate sheaves.
	Speed setting too high for application of tool, thus reducing torque.	Reduce speed, creating more torque.
	Speed control set at inaccurate RPM.	Recalibrate RPM settings **(See page D-6)**
Excessive vibration at high speed.	Drive belt worn.	Replace drive belt.
	Poly V-belt worn.	Replace Poly V-belt.
	Accessory is improperly mounted on spindle.	Mount accessory properly.
	Accessory out of balance or misaligned.	Repair accessory or check alignment.

Problem	Possible Cause	Solution
Metal-on-metal clatter or banging at all speeds.	Fan sheave rubbing on motor bracket.	Check Allen screw that holds sheave to motor shaft. If loose, tighten it. If tight, sheave may be worn into spacer. Replace sheave and spacer.
Metal-on-metal clatter or banging at high speeds.	Control sheave assembly hitting speed control bracket.	Reset high speed stop in speed control dial.
Belts slipping or squealing.	Poly V-belt loose.	Tension Poly V-belt.
	Poly V-belt worn.	Replace Poly V-belt.
	Drive belt worn.	Replace drive belt.
	Forcing material.	Do not force material, slow down.
Motor runs, auxiliary spindles turn, but main spindle doesn't turn.	Drive and ring assembly disconnected or broken.	Reconnect or replace drive and ring assembly.
Motor runs, lower auxiliary spindle turns, but upper auxiliary and main spindles don't turn.	Poly V-belt worn or broken.	Replace Poly V-belt.
Motor runs, but none of the spindles turn.	Drive belt worn or broken.	Replace drive belt.
	Retaining ring and washer off motor shaft.	Reassemble retaining ring, washer and motor shaft spring on motor shaft.
Top of headstock gets hot.	Poly V-belt improperly tensioned.	Tension Poly V-belt properly.
	Air flow clogged	Clean.
	Motor over heating	Replace Motor.
	Drive Sleeve/Idler Shaft - missing lower auxillary hub.	Assemble.
	Quill Feed - bearings worn.	Replace bearings.

Problem	Possible Cause	Solution
Electrical		
Motor starts and stops intermittently.	Switch defective.	Replace switch.
	Main windings in the motor defective (also can make the motor pulsate).	Replace the motor. **Should be done by an authorized Service Dealer or Shopsmith Factory Repair.**
Fuses blow or breakers trip.	Capacity of circuit too small.	Use circuit rated at least 15 amps.
	Standard or "fast blow" fuses used.	Install "slow blow" fuses or breakers.
	Circuit overloaded.	Plug Mark V into its own circuit.
		Replace extension cord/circuit breaker.
	Work being forced.	Take your time; let the machine do the work.
	Rip fence or miter gauge misaligned, blade or disc binds.	Align rip fence or miter gauge.
	Poly V-belt too tight.	Loosen Poly V-belt slightly.
	Short in motor.	Replace the motor. **Should be done by an authorized Service Dealer or Shopsmith Factory Repair.**
Switch hard to operate.	Switch defective.	Replace switch.
Touching Mark V causes shock.	Switch or wire disconnected.	Reconnect switch or wires.
	Machine improperly grounded.	Ground the plug.
		Attach grounding wire to motor.
	Defective wiring.	Overhaul wiring.

Problem	Possible Cause	Solution
Speed Changer		
Mark V won't change from high to low/low to high.	Control or floating sheave stuck on idler shaft.	Free sheave, lubricate sheave and idler shaft.
	Quadrant assembly rack worn.	Replace quadrant assembly.
Speed setting creeps up when Mark V running.	Dial spring under speed control handle doesn't press hard enough against handle.	Remove handle, gently bend spring up slightly or replace.
	Quadrant assembly rack worn.	Replace quadrant assembly.
	Worm control shaft gear worn.	Replace worm control shaft.
Speed control dial hard to turn.	Sheaves sticking.	Lubricate motor sheaves and idler shaft and sheaves.
	Control quadrant rack needs lubrication.	Lubricate rack with axle grease.
	Foreign material in quadrant assembly.	Clean quadrant assembly and lubricate.
Speed changes when speed control handle is turned, but speed control dial doesn't move.	Gear behind handle stripped.	Replace handle, idler gear, or speed dial, whichever is worn.
Speed control dial moves when speed control handle is turned, but speed doesn't change.	Quadrant assembly rack worn.	Replace quadrant assembly.
	Retaining loop on control sheave assembly disconnected.	Connect retaining loop to quadrant assembly.
	Speed control handle improperly mounted to worm control shaft.	Tighten setscrew in handle so that it seats in depression on worm control shaft.
Speed control dial rattles.	Spring under speed dial broken or missing.	Replace spring.

Problem	Possible Cause	Solution
Speed control dial doesn't lie flat in power plant.	Screws loose, missing, or holes stripped in ctrl bracket.	Tighten or replace screws. If holes are stripped, add nuts.
Speed control handle comes off.	Speed control handle improperly mounted to worm control shaft.	Tighten setscrew in handle so that it seats in depression on worm control shaft.
Quill and Main Spindle		
Excessive play in main spindle.	Main spindle bent.	Replace Quill Assy.
	Spindle collar improperly seated.	Loosen setscrew in collar. Pull out on spindle while pushing in on collar and tighten set-screw.
	Drive and ring assembly worn.	Replace drive and ring assembly.
	Bearing worn.	Replace quill or main spindle assembly
Quill sticks or binds when extended.	Foreign material in rack.	Clean and wax quill.
	Setscrew that rides in groove on top of quill too tight.	Loosen setscrew.
	Burrs on quill or in headstock.	Remove burrs with fine file.
	Not enough tension on quill spring.	Tension spring.
Quill will not lock in position.	Washer under quill lock missing, broken or assembled improperly.	Replace or assemble washer properly.
Quill clicks when extended and will not retract.	Quill spring broken or disconnected.	Replace or reconnect spring and retension.
	Screw that holds end of spring broken.	Replace screw and tension spring.
	Setscrew holding spring housing in headstock loose.	Align notch in housing with setscrew, then tighten and tension setscrew.(Do not overtighten).

Problem	Possible Cause	Solution
Quill cannot be extended.	Setscrew in top of headstock too tight.	Loosen setscrew 1/8 turn.
	Quill lock secured.	Loosen quill lock.
	Foreign material in rack.	Clean and wax quill.
Main spindle heats up.	Bearing worn.	Replace quill.
Main spindle wobbles.	Main spindle bent.	Replace quill.
Auxiliary Spindles Lower auxiliary spindle heats up.	Poly V-belt too tight.	Loosen tension on Poly V-belt.
	Bearing worn.	Replace idler shaft.
Drive sleeve shaft heats up.	Poly V-belt too tight.	Loosen tension on Poly V-belt.
	Bearings worn.	Replace quill.
Lower auxiliary shaft rubbing against belt cover or moves in and out when changing speeds.	Bolt that holds bushing loose.	Adjust belt and tighten bolt. **(Do not Overtighten).**
	Screw that retains eccentric bushing missing, broken or loose.	Replace or tighten screw.
Auxiliary spindles are slow or stop.	Sheaves sticking.	Lubricate motor and idler shafts.
	Poly V-belt loose.	Tension Poly V-belt.
	Drive belt jammed between upper sheaves.	Turn speed control to high, spreading upper sheaves apart.
	Poly V-belt worn.	Replace Poly V-belt.
	Drive belt worn.	Replace drive belt.

Problem	Possible Cause	Solution
Worktable and Carriage		
Table hard to raise and lower.	Racks and pinions clogged with foreign materials.	Clean racks and pinions. Wax and buff table support tubes.
	Table height lock secured.	Loosen lock.
	Pinion gears damaged.	Replace pinions.
	Burrs on table extrusions or in carriage holes.	Remove burrs with fine file.
	Table extrusions damaged.	Replace extrusions. **(Factory job)**
	Front and back table post racks not in alignment with each other.	Turn table height adjusting handle to raise table while lifting tie bar assembly. Once posts are free of carriage, adjust table until racks engage pinions simultaneously. Lower table into carriage.
Table miter slots seem to give two different cuts.	Miter gauge protractor face not flat.	Replace protractor.
	Square used to align miter gauge not square.	Use precision square.
	Miter gauge glides not adjusted.	Adjust glides.
	Table warped.	Replace table.
	Table improperly aligned.	Align table.
Table wobbles.	Tilt lock loose.	Secure tilt lock.
	Trunnion bolts loose.	Tighten bolts.
	Carriage lock loose.	Secure carriage lock.
Table won't fit in carriage.	Racks and pinions clogged with foreign materials.	Clean racks and pinions. Wax and buff table support tubes.
	Table height lock secured.	Loosen lock.

Problem	Possible Cause	Solution
	Tie bar assembly bent.	Push table support tubes together or spread them apart slightly. If this doesn't work, replace tie bar assembly.
Table insert not flush with table (too low).	Wood catches.	Place a peice of masking tape underneath until it is even with table.
Table insert not flush with table (too high).	Sawdust under insert.	Remove insert and clean.
Table won't tilt to drill press position.	Tilt lock secured.	Loosen tilt lock.
	Impacted sawdust in trunnions.	Clean trunnions **(Do not Wax)**.
	Table trunnion bolts not properly located, causing binding.	Loosen trunnion bolts and re-align.
Carriage shifts on way tubes after being locked in position.	Carriage lock handle improperly adjusted.	Tighten nut on back of carriage lock handle shaft.
Table won't lower to boring position.	Impacted sawdust on support tube racks or pinions.	Clean racks and/or pinions.
Carriage lock sticks.	Foreign material in mechanism.	Clean carriage lock mechanism.
	Lock too tight.	Only tighten 1/4 turn past 'snug.'
Table will not lock at desired height.	Table height lock not secure.	Secure lock.
Way Tubes and Locks Way tubes are dented and/or locks make a popping sound when released.	Headstock and carriage locks too tight.	Only tighten 1/4 turn past 'snug.'
Carriage and headstock hard to slide on way tubes.	Way tubes need waxing.	Wax and buff way tubes.

Problem	Possible Cause	Solution
Carriage and headstock hard to slide on way tubes (cont'.).	Too much wax on way tubes.	Buff wax thoroughly.
	Way tubes dented.	Turn way tubes 1/4 turn. If dents are too deep, file with fine file or replace way tubes.
	Way tubes scored.	Clean and resurface tubes with wet/dry sandpaper and oil. Also clean inside surfaces of mounting holes in power plant.
	Way tubes corroded.	Clean way tubes with steel wool, wax and buff.
Carriage and headstock won't move apart.	Carriage and/or headstock locks too tight. Way tubes in a bind.	Loosen locks.
Way tubes corroded.	Mark V not maintained often enough.	Clean way tubes with steel wool, wax and buff.
Way tube tie bar loose on headrest.	Headrest lock handle not secure.	Secure lock.
	Headrest lock handle improperly adjusted.	Adjust handle.
Headrest lock hard to tighten.	Headrest lock handle improperly adjusted.	Adjust handle.
Mark V won't tilt to vertical position.	Extension table in base mount.	Remove extension table.
	Headrest lock too tight.	Adjust handle.
	Base lock turned in too far.	Unscrew base lock.
	Screws in underside of bar loose.	Tighten screws.
Miter Gauge		
Miter gauge binds in slots.	Taper screw in bar turned in too far.	Back out taper screw.

Problem	Possible Cause	Solution
Miter gauge binds in slots (cont.'d).	Miter gauge bar bent.	Replace bar.
	Table warped.	Replace table.
	Burrs in table slots or bar.	Remove burrs with fine file.
	Foreign material in table slot.	Clean, wax and buff table slots.
Miter gauge rocks side to side.	Glides improperly adjusted.	Adjust glides.
Wood teeters on miter gauge protractor.	Protractor face warped.	Replace protractor.
Miter gauge does not cut indicated angle.	Angle stops inaccurately set.	Reset stops.
	Tool used to set angle not accurate.	Use precision tool.
	Scale improperly adjusted.	Adjust scale.
	Protractor face warped.	Replace protractor.
	Wood not being held firmly against miter gauge.	Hold wood firmly. Use safety grip, whenever possible.
Safety grip makes marks on wood.	Too much hand grip pressure.	Use less pressure.
	Burr on shoe.	Remove burr with fine file.
Extension Table		
Extension table not level with worktable.	Extension table offset slightly or not properly aligned.	Use the jam nuts to adjust the table up or down as needed.
Extension table difficult to mount.	Accessory mount (headrest) handle blocking holes.	Loosen handle.
	Tubes dirty.	Clean, wax and buff tubes.
	Burrs in holes or on tubes.	Remove burrs with fine file.
	Tubes are bent or pinched.	Replace base assembly.

Problem	Possible Cause	Solution
Extension table difficult to mount (cont.').	Tubes are bowed in or out.	Push support tubes together or spread them apart slightly. If this doesn't work, replace base assembly.
Saw Blades Saw blade wobbles.	Saw blade improperly mounted on arbor.	Mount saw blade properly.
	Saw blade not secure on arbor.	Tighten blade on arbor.
	Arbor not secure on spindle.	Tighten arbor on spindle.
	Main spindle bent.	Replace quill.
	Bearing worn.	Replace bearing. **(Factory job)**
	Drive and ring assembly worn.	Replace drive and ring assembly.
	Foreign material between arbor and blade.	Remove blade from arbor and clean.
	Blade warped.	Slight warps are normal and will straighten as machine reaches cutting speed. If warped more than 1/16", replace blade.
Saw blade loads up with pitch or resin.	Saw blade dull.	Touch up or sharpen blade.
	Normal buildup due to certain woods.	Clean blade with saw pitch remover or resin remover.
	Rip fence improperly aligned.	Align rip fence.
	Table out of alignment.	Align table.
	Blade mounted backwards.	Mount blade correctly.
	Wrong blade for job.	Use proper blade.
	Wrong saw speed.	Use proper speed.

Problem	Possible Cause	Solution
Upper and Lower Saw Guards		
Wood hits or binds on splitter.	Splitter or riving knife improperly aligned.	Align splitter or knife.
	Splitter or riving knife bent.	Bend splitter or knife slightly. If this doesn't work, replace splitter or knife.
Upper guard hits blade.	Guard improperly aligned.	Align guard.
Upper guard hard to mount.	Splitter fastening system not secure.	Secure fastening system.
	Foreign material in mounting slots.	Clean slots with mineral spirits or turpentine. **Do not use lacquer thinner.**
Upper guard cloudy.	Impacted sawdust on guard.	Remove insert and clean with mineral spirits or turpentine. **Do not use lacquer thinner.**
Left side of lower guard binds or sticks.	Rods need lubrication.	Apply dry lube product to rods.
	Foreign material in guard.	Clean guard.
Sanding Disc		
Disc wobbles.	Disc not secure on spindle.	Tighten setscrew in hub.
	Drive and ring assembly worn.	Replace drive and ring assembly.
	Disc warped.	Replace disc.
	Spindle collar loose.	Remove disc, hold outward pressure on spindle to take up slack, push collar in toward quill housing and lock setscrew. Or, add shims between outer quill bearing and retaining ring.

Problem	Possible Cause	Solution
Sandpaper won't stick to disc.	Disc dirty.	Clean disc with denatured alcohol.
	Adhesive worn out.	Replace sandpaper.
Sandpaper tears or wears out quickly.	Too much pressure and/or sanding in one spot.	Use light, even pressure. Keep wood moving.
	Sandpaper wet, then dried.	Replace sandpaper.
	Sandpaper loaded with sawdust.	Clean sandpaper with cleaning stick.
Sandpaper loads with sawdust.	Wood wet, oily, glued or painted.	Clean sandpaper with cleaning stick.
	Sanding in one spot.	Keep wood moving.
	Too much pressure.	Use light, even pressure.
Drill Chuck Chuck hard to tighten or loosen.	Chuck sticking.	Apply dry lube product.
	Chuck corroded.	Replace chuck.
	Internal gears broken.	Replace chuck.
Chuck wobbles.	Chuck loose on spindle.	Tighten setscrew in chuck.
	Chuck defective.	Replace chuck.
	Main spindle bent.	Replace quill.
Lathe Accessories Drive center tears wood	Drive center not driven far enough into wood.	Drive center spurs must penetrate 1/16" into workpiece.
	Spindle not held tightly between centers.	Apply more pressure with quill feed.
Small dents or nicks in tool rest.	Normal wear from chisels.	File or grind tool rest flat again. Also file sharp corners off shanks of chisels to keep this from happening again.

Problem	Possible Cause	Solution
Tool rest tube difficult to mount.	Tube and/or pinions dirty.	Clean tube and pinions.
Tool rest turns when working	Table height lock is loose.	Secure lock.
	Setscrew in arm loose.	Tighten setscrew.
	Tool rest mounting pin (where arm and tool rest join) worn by setscrew.	Replace tool rest.
Table Sawing		
Cut not square or not at the indicated angle.	Table improperly aligned with main spindle.	Align table.
	Rip fence not parallel to blade.	Align rip fence and/or table.
	Miter gauge improperly adjusted.	Adjust miter gauge.
	Protractor face warped.	Replace protractor.
	Table and/or blade shifts. Work shifts as you cut.	Secure all locks. Hold the work firmly against the table, rip fence and/or miter gauge.
	Square not square.	Use precision square.
Wood binds when cutting.	Work shifts as you cut.	Hold the work firmly against the table, rip fence and/or miter gauge.
	Wrong blade for job.	Use proper blade.
	Table improperly aligned with main spindle.	Align table.
	Rip fence not parallel to blade.	Align rip fence and/or table.
	Rip fence extrusion bowed.	Replace rip fence extrusion.
	Splitter ad/or riving knife not aligned with blade.	Align splitter and/or riving knife.

Problem	Possible Cause	Solution
Wood binds when cutting (cont.').	Table and/or blade shifts.	Secure all locks.
	Wood improperly seasoned.	Use only dry, seasoned wood.
Wood stops or sticks during cut.	Mounting screws in table insert tightened improperly.	Tighten screws properly.
	Splitter not aligned with blade.	Align splitter.
	Saw blade prone.	Make sure wood is clear of saw blade.
	Table needs wax.	Wax and buff table.
Wood burns.	Blade dull and/or dirty.	Touch up or sharpen and/or clean blade.
	Table improperly aligned with main spindle.	Align table.
	Rip fence improperly aligned.	Align rip fence and/or table.
	Blade mounted backwards.	Mount blade correctly.
	Wrong blade for job.	Use proper blade.
	Table and/or blade shifts.	Secure all locks.
	Wrong saw speed.	Use proper speed.
Black marks appear on wood.	Table and/or rip fence need wax.	Wax and buff table and rip fence.
Cut edge is rippled or uneven.	Work shifts as you cut.	Hold the work firmly against the table, rip fence, and/or miter gauge.
	Table and/or blade and/or fence shifts.	Secure all locks.
	Blade not secure on arbor.	Tighten blade on arbor.
	Arbor not secure on spindle.	Tighten arbor on spindle.
	Foreign material between arbor and blade.	Remove blade from arbor and clean.

Problem	Possible Cause	Solution
Cut edge is rippled or uneven (cont.').	Blade warped.	Replace blade.
	Set of the teeth on blade worn or incorrect.	Reset teeth at professional saw shop.
	Feed rate too fast.	Feed work slower.
	Table improperly aligned with main spindle.	Align table.
	Rip fence improperly aligned.	Align rip fence and/or table.
	Wrong blade for job.	Use proper blade.
	Wrong saw speed.	Use proper speed.
Wood hard to cut.	Blade dull.	Touch up or sharpen blade.
	Table and/or blade shifts.	Secure all locks.
	Table improperly aligned with main spindle.	Align table.
	Rip fence improperly aligned.	Align rip fence.
	Feed rate too fast.	Feed work slower.
	Blade mounted backwards.	Mount blade correctly.
	Wrong blade for job.	Use proper blade.
	Wrong saw speed.	Use proper speed.
	Very hard wood.	Take your time; don't force work.
	Wood improperly seasoned.	Use only dry, seasoned wood.
Disc Sanding		
Wood burns.	Sandpaper worn.	Replace sandpaper.
	Too much pressure and/or sanding in one spot.	Use light, even pressure. Keep wood moving.

Problem	Possible Cause	Solution
Wood burns (cont.').	Sandpaper loaded with sawdust.	Clean sandpaper with cleaning stick.
	Speed too high.	Reduce speed.
	Grit too fine.	Use coarser grit.
Wood lifts from table or 'chatters'.	Sanding on upward motion side of disc.	Sand on downward motion side only.
	Work improperly held.	Hold work firmly on table.
	Table too far from disc.	Move table closer to disc.
	Center of sanding disc above table.	Set table height just above center of disc.
	Disc warped.	Replace disc.
Work jams between disc and worktable.	Table too far from disc.	Move table closer to disc.
Angle on sanded edge not as indicated.	Table not square to disc.	Align table.
	Table and/or disc shifts.	Secure all locks.
	Tool used to set angle not accurate.	Use precision tool.
	Miter gauge improperly set.	Adjust miter gauge.
	Work improperly held.	Hold work firmly on table.
	Protractor face warped.	Replace protractor.
Sanded surface rippled or scored.	Grit too coarse.	Use finer grit.
	Disc warped.	Replace disc.
	Work improperly held.	Hold work firmly on table.
	Trying to remove too much stock.	Reduce pressure.
	Table and/or disc shifts.	Secure all locks.

Problem	Possible Cause	Solution
Sanded surface rippled or scored (cont.').	Sanding in one spot.	Keep work moving.
Raised area on sanded surface.	Center of sanding disc above table and sanding in one spot.	Set table height just above center of disc and keep work moving.
	Sandpaper worn.	Replace sandpaper.
Wood difficult to sand.	Sandpaper loaded with sawdust.	Clean sandpaper with cleaning stick.
	Speed too low.	Increase speed.
	Grit too fine.	Use coarser grit.
	Wood very hard.	Use slightly slower speed.
Drilling and Boring		
Bit wanders from hole center.	Bit dull.	Sharpen bit.
	Bit improperly mounted in chuck.	Secure bit properly.
	Quill bearing worn.	Replace Quill Assembly.
	Bit bent.	Replace bit.
	Chuck loose on spindle.	Tighten setscrew in chuck.
	Main spindle bent.	Replace Quill Assembly.
	Cutting too fast.	Reduce pressure.
Entrance of hole ragged.	Bit dull.	Sharpen bit.
	Wrong bit for job.	Use proper bit.
	Wrong drilling speed.	Use proper speed.
Exit of hole ragged.	Work improperly backed up.	Back up work with scrap wood.
	Bit dull.	Sharpen bit.

Problem	Possible Cause	Solution
Exit of hole ragged (cont'.).	Wrong type of bit.	Use proper bit.
	Wrong drilling speed.	Use proper speed.
	Normal for some materials.	Drill hole part way through, turn work over and finish hole from other side.
Sides of hole ragged.	Bit dull.	Sharpen bit.
	Wrong bit for job.	Use proper bit.
	Wrong drilling speed.	Use proper speed.
Hole not at indicated angle.	Table improperly aligned with main spindle.	Align table.
	Miter gauge improperly adjusted.	Adjust miter gauge.
Hole too deep or too shallow.	Feed stop improperly set.	Set feed stop.
	Feed stop not secured.	Tighten feed stop handle.
	Feed stop broken.	Replace feed stop.
	Rip fence or miter gauge slipped.	Secure rip fence and/or miter gauge.
	Feed stop improperly assembled.	Assemble feed stop properly.
	Chuck loose on spindle.	Tighten setscrew in chuck.
	Carriage, table, or power plant not locked.	Secure all locks.
	Drill bit loose in chuck	Secure drill bit in chuck.
Hole too big.	Wrong size bit.	Use correct size bit.
	Stock not secured.	Clamp stock.
	Bit bent.	Replace bit.
	Main spindle bent.	Replace Quill Assembly.

Maintenance and Troubleshooting Mark V Model 520

Problem	Possible Cause	Solution